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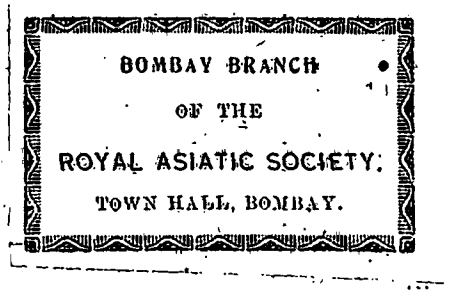

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i) General educational tables for Br. India 1941-42.

ii) Development of higher technical institutions in India (Interim report of Sarker Committee).

iii) Proceedings of the first meeting of All India Council for technical education held at New Delhi on the 30th April, 1st and 2nd May, 1946.

iv) Scientific man-power Committee (Interim Report).

v) Report of the Second Wardha education committee of the Central advisory board of education, 1939, together with the decisions of the Board thereon.

vi) Report of the expert committee of the Central Advisory board of education on uniform Indian Braille with ink-print charts for Indian alphabets.

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GENERAL EDUCATIONAL TABLES

FOR

BRITISH INDIA

1941-42

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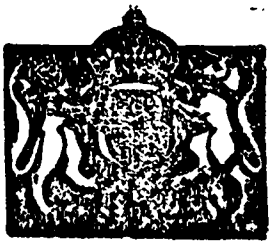

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BRITISH INDIA.

GENERAL EDUCATIONAL TABLES, 1941-42.

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General Summary of Educational Institutions and Scholars.

		Percentage of Scholars to population.			
		Recognized Institutions.		All Institutions.	
Area in square miles . 862,324		*1942.	*1941.	*1942.	*1941.
Population*—					
Males . . . 153,198,533					
Females . . . 142,954,512					
Total . 296,153,045	Males . . .	7·74	8·80	8·01	9·13
	Females . .	2·51	2·73	2·61	2·84
	Total .	5·21	5·86	5·40	6·08

Recognized Institutions.	Institutions.			Scholars.			Stages of Instruction of Scholars entered in column 4.	
	*1942.	*1941.	Increase or decrease.	*1942.	*1941.	Increase or decrease.		
	1	2	3	4	5	6	7	
Universities . . .	15	15	..	(e)12,532	12,622	—90	..	
For Males.								
Arts Colleges . . .	291	280	+11	114,572	109,098	+5,474	(a)	39,410
							(b)	73,538
							(c)	883†
Professional Colleges .	82	77	+5	26,078	25,435	+643	(a)	15,437
							(b)	1,720
High Schools . . .	3,496	3,362	+134	1,189,204	1,182,012	+7,192	(c)	991,304
							(d)	197,900
Middle Schools . .	9,871	9,591	+280	1,245,563	1,224,850	+20,713	(c)	562,250
							(d)	683,313
Primary Schools . .	157,827	161,121	—3,294	10,498,787	10,258,159	+240,628	(d)	10,498,740‡
Special Schools . .	11,536	10,922	+614	446,319	443,403	+2,916	..	
Totals .	183,103	185,353	—2,250	13,520,523	13,242,957	+277,566	..	
For Females.								
Arts Colleges . . .	47	45	+2	5,159	5,006	+153	(a)	1,487
							(b)	3,578
							(c)	94
Professional Colleges .	11	8	+3	913	801	+112	(a)	256
							(b)	439
High Schools . . .	539	497	+42	144,744	143,562	+1,182	(c)	92,715
							(d)	52,010
Middle Schools . .	1,291	1,248	+43	205,278	202,887	+2,391	(c)	50,266
							(d)	155,005
Primary Schools . .	24,141	26,042	—1,901	1,519,939	1,539,648	—19,709	(d)	1,519,939§
Special Schools . .	767	705	+62	32,089	30,870	+1,219	..	
Totals .	26,796	28,545	—1,749	1,908,122	1,922,774	—14,652	..	
Unrecognized Institutions.								
For Males . . .	14,270	14,737	—467	450,858	480,753	—29,895	..	
For Females . . .	3,869	4,124	—255	101,152	109,778	—8,626	..	
Totals .	18,139	18,861	—722	552,010	590,531	—38,521	..	
Grand Totals .	228,053	232,774	—4,721	15,993,187	15,768,884	+224,303	..	

(a) In Graduate and post-graduate classes. (b) In Intermediate classes. (c) In Secondary stage.
(d) In Primary stage.
(e) Includes 19 scholars of Professional Colleges undergoing Pandits' training in the Annamalai University, 63 scholars of Professional Colleges in the Department of Chemical Technology in Bombay and 52 Law scholars in Delhi.
*Excludes figures relating to the Administered Area of the British Reserve in Manipur.
†Includes 72 male scholars in Primary stage in Assam.
‡ ,, 1,112 male scholars in Secondary stage in Bihar and Assam.
§ ,, 296 female scholars in Secondary stage in Bihar and Assam.
N.B. 1.—There are also 6 Boards of Secondary and Intermediate Education in British India which are not separately shown in this table.
N.B. 2.—Details under column 7 do not in some cases agree with the totals under column 4 as classification by stages in respect of all scholars has not been furnished by all provinces.

General Summary of Expenditure on Education.

	Total expenditure			Percentage of expenditure from				cost per Scholar to				
	‡1942.	‡1941.	Increase or decrease.	Govt. funds.	* Local funds.	Fees.	Other sources.	Govt. funds.	* Local funds.	Fees.	Other sources.	Total cost per scholar.
	1	2	3	4	5	6	7	8	9	10	11	12
	Rs.	Rs.	Rs.					Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Direction and Inspection	1,15,78,394	1,11,63,612	+4,14,782	91·6	8·2	..	0·2	..	..	..	..	..
Universities	1,54,45,565	1,40,98,580	+13,46,985	32·5	..	46·9	20·6	..	..	..	..	..
Boards of Secondary and Intermediate Education.	5,19,687	4,57,076	+62,611	9·2	..	90·5	0·3	..	..	..	..	..
†Miscellaneous	4,09,99,114	4,00,18,042	+9,81,072	36·5	10·8	20·7	32·0	..	..	..	..	..
Totals	6,85,42,700	6,57,37,310	+28,05,460	44·7	7·8	23·6	23·9	..	..	..	..	..
Institutions for Males.												
Arts Colleges	1,92,53,199	1,82,83,424	+8,70,775	32·8	0·2	55·2	11·8	58 5 11	0 4 9	98 3 1	20 15 11	177 13 8
Professional Colleges	84,62,833	82,63,607	+1,99,226	57·7	1·9	32·4	8·0	186 3 10	5 15 8	104 11 9	25 14 6	322 13 9
High Schools	5,78,52,307	5,61,08,928	+17,43,379	25·7	3·5	60·8	10·0	11 12 8	1 9 10	27 13 7	4 9 6	45 13 7
Middle Schools	2,29,02,569	2,25,55,081	+3,47,488	37·5	19·3	33·8	9·4	6 14 5	3 8 8	6 3 5	1 11 8	18 6 2
Primary Schools	7,93,53,016	7,61,95,583	+31,57,433	56·4	31·6	4·8	7·2	4 4 3	2 6 3	0 5 9	0 8 8	7 8 11
Special Schools	1,63,95,278	1,63,79,459	+15,819	55·8	5·0	16·9	22·3	20 8 0	1 13 10	6 3 1	8 2 10	36 11 9
Totals	20,42,19,202	19,78,85,082	+63,34,120	43·5	15·9	30·7	9·9	6 9 0	2 6 4	4 10 1	1 8 0	15 1 5
Institutions for Females.												
Arts Colleges	11,68,276	10,54,713	+1,13,563	43·9	0·4	38·3	17·4	131 0 11	1 2 11	114 6 11	52 2 2	298 12 11
Professional Colleges	5,77,675	5,70,988	+6,687	67·8	1·5	14·2	16·5	428 15 5	9 9 4	89 15 9	104 3 1	632 11 7
High Schools	1,08,58,779	1,03,32,164	+5,26,615	38·1	2·2	41·4	18·3	27 10 0	1 8 11	30 0 6	13 3 8	72 7 1
Middle Schools	48,10,448	48,63,867	—53,419	40·0	15·1	18·2	26·7	9 6 0	3 8 10	4 4 1	6 4 0	23 6 11
Primary Schools	1,55,98,585	1,50,61,676	+5,36,909	44·7	41·4	3·3	10·6	4 9 4	4 4 0	0 5 5	1 1 5	10 4 2
Special Schools	28,03,818	28,66,066	—62,248	61·5	2·1	8·8	27·6	53 11 8	1 13 6	7 11 8	24 1 2	87 6 0
Totals	3,58,17,581	3,47,49,474	+10,68,107	43·8	20·9	18·6	16·7	8 3 6	3 14 10	3 7 9	3 2 3	18 12 4
Grand Totals	30,85,79,543	29,83,71,866	+1,02,07,677	43·8	14·7	27·7	13·8	8 12 1	2 14 11	5 8 7	2 12 2	19 15 9

N.B.—For explanation of certain terms used in the tables please see overleaf.

* Includes both District Board and Municipal Funds.

† " expenditure on buildings.

‡ Excludes figures relating to the Administered Area of the British Reserve in Manipur.

EXPLANATIONS.

1. *School Year.*—In these tables the school year is assumed to coincide with the financial year, *i.e.*, to extend from April 1st of one year to March 31st of the next though in actual practice some institutions, *e.g.*, Anglo-Indian and European schools, may close in December and others, *e.g.*, colleges, in May.

2. *Recognised Institutions* are those in which the course of study followed is that which is prescribed or recognised by the Department of Public Instruction or by a University or a Board of Secondary and Intermediate Education constituted by law and which satisfy one or more of these authorities, as the case may be, that they attain to a reasonable standard of efficiency. They are open to inspection and their pupils are ordinarily eligible for admission to public examinations and tests held by the Department or the University or the Board.

3. *Unrecognised Institutions* are those which do not come under the above definition of recognised institutions. They are for the most part indigenous institutions for education of a religious character.

4. *Other sources* include income from endowments, subscriptions, contributions, etc.

5. *Classification.*—In Tables IV-A and IV-B, provision has been made for twelve school classes covering the primary, middle and high school sections. The figures for the lowest class in the primary section or school, whether called infant class, sub-standard A, preparatory class or class I, should be entered against class I in the tables and the figures of the succeeding higher classes should be shown against Classes II, III, IV etc., up to the end of the school course without any break in the sequence of classes. Should the number of classes be less than twelve in a school, the figures of the top class should be shown against Classes XI, IX or X according as the total number of classes is eleven, ten or nine, and so on. Where the number of classes exceeds twelve, the figures of the additional classes should be shown after Class XII for each class separately. The figures of the intermediate classes of Intermediate Colleges should not be shown under "school education", but should be entered against 1st year and 2nd year intermediate classes under "university and intermediate education". As a general rule, the duration of each class is taken to be one scholastic year.

6. *Intermediate colleges and examinations.*—An "Intermediate college" means an institution preparing students for admission to the degree courses of a University or for entrance into vocational colleges. The intermediate examination means an examination qualifying for admission to a course of studies for a degree.

7. *Anglo-Indian and European scholars* are included in the General Summary and General Tables II-A and B, IV-A and B, V-A and B, VIII and IX. The *expenditure* on Anglo-Indian and European Schools is included in the General Summary and General Tables IIIA and B. *Teachers* in Anglo-Indian and European Schools are included in Tables VI-A and B.

8. All statistics refer to Recognised Institutions only, except where side-headings for Unrecognised Institutions are entered.

9. In Tables IV-A and B and V-A and B, the top-heading "*Hindus*" may be sub-divided into such necessary sub-headings as may be considered suitable in each province, *e.g.*, "Higher castes" and "Depressed" or "Bakward classes", or "Brahmins" and "Non-Brahmins", etc. [In the consolidated tables for all India, all Hindu scholars will, however, be entered in one column only.]

10. Table X is prepared at the end of each quinquennium and gives figures for the last year of the quinquennium only.

11. In calculating the expenditure from Government, District Board or Municipal Funds, entered in Tables III-A and B and other expenditure tables, all payments or contributions from fees and other sources, which are credited to such funds, should be deducted.

I.—Classification of Educational Institutions.

	For Males.						For Females.					
	Government. 1	District Board. 2	Municipal Board 3	Aided. 4	Unaided. 5	Total. 6	Government. 7	District Board 8	Municipal Board 9	Aided. 10	Unaided. 11	Total. 12
RECOGNISED INSTITUTIONS.												
Universities	..	..	..	15	..	15	..	..	..	..	..	..
Boards of Secondary and Intermediate Education.	4	..	..	1	1	6	..	..	..	..	..	..
Colleges—												
Arts and Science*	38	1	..	104	37	180	5	..	..	16	8	29
Law	4	..	..	2	9	15	..	..	..	..	..	..
Medicine	10	..	1	1	..	12	..	..	..	2	..	2
Education‡	16	..	..	2	4	22	2	..	..	4	3	9
Engineering	6	..	..	1	..	7	..	..	..	..	..	..
Agriculture	6	..	..	1	1	8	..	..	..	..	..	..
Commerce	1	..	..	4	5	10	..	..	..	..	..	..
Technology	..	..	..	2	..	2	..	..	..	..	..	..
Forestry	2	..	..	..	..	2	..	..	..	..	..	..
Veterinary Science	4	..	..	..	..	4	..	..	..	..	..	..
Intermediate and 2nd grade Colleges.	21	..	1	69	20	111	4	..	..	12	2	18
Totals	108	1	2	186	76	373	11	..	..	34	13	58
High Schools	308	195	131	1,985	877	3,496	86	2	12	409	30	539
Middle Schools. English	77	867	163	3,104	912	5,123	28	10	42	438	72	590
Middle Schools. Vernacular	57	4,302	94	199	96	4,748	130	186	123	251	11	701
Primary Schools	2,653	68,816	5,607	75,530	5,221	157,827	399	6,906	2,122	12,930	1,784	24,141
Totals	3,095	74,180	5,995	80,818	7,106	171,194	643	7,104	2,299	14,028	1,897	25,971
Special Schools—												
Art	8	1	1	7	2	19	..	..	..	..	..	..
Law	..	..	..	..	..	..	..	..	..	..	..	..
Medical	16	..	..	10	3	29	..	..	..	1	..	1
Normal and Training	300	7	4	44	18	373	124	..	3	94	18	239
Engineering†	7	..	..	3	..	10	..	..	..	..	..	..
Technical and Industrial.	142	31	13	270	40	496	13	..	1	142	8	164
Commercial	18	..	..	15	361	394	..	..	..	4	1	5
Agricultural	9	1	..	5	1	16	..	..	..	2	..	2
Reformatory	14	..	..	1	..	15	..	..	..	1	..	1
Schools for Defectives.	1	1	3	45	4	54	..	..	..	3	2	5
Schools for Adults	2,212	144	199	2,136	2,026	6,717	116	9	1	130	..	256
Other Schools	40	20	9	2,697	647	3,413	1	..	..	73	20	94
Totals	2,767	205	229	5,233	3,102	11,536	254	9	5	450	49	767
Totals for Recognised Institutions.	5,974	74,386	6,226	86,253	10,285	183,124	908	7,113	2,304	14,512	1,959	26,796
Unrecognised Institutions	..	574	14	278	13,404	14,270	..	40	16	11	3,802	3,869
Grand Totals, all Institutions.	5,974	74,960	6,240	86,531	23,689	197,394	908	7,153	2,320	14,523	5,761	30,665

*Includes *Oriental Colleges*.
† ,, *Survey* Schools.
‡ ,, the Prince of Wales' Royal Indian Military College, Dehra Dun and Government Basic Training College, Allahabad

II-A.—Distribution of Scholars attending

	Government.			District Board.			Municipal Board.		
	Scholars on roll on March 31st.	Average daily attendance.	No. of residents in approved hostels.	Scholars on roll on March 31st.	Average daily attendance.	No. of residents in approved hostels.	Scholars on roll on March 31st.	Average daily attendance.	No. of residents in approved hostels.
	1	2	3	4	5	6	7	8	9
Reading—									
RECOGNISED INSTITUTIONS.									
University and Intermediate Education (a).									
Arts and Science (*b*)&(*c*)	24,336	19,948	5,417	110	104	..	243	237	28
Law	1,268	1,013	226	..	..	..	..	..	..
Medicine	3,981	3,482	1,342	..	..	..	508	400	174
Education	1,535	1,438	972	..	..	..	..	..	..
Engineering	1,794	1,612	1,137	..	..	..	..	..	..
Agriculture	1,223	1,182	988	..	..	..	..	..	..
Commerce	796	736	60	..	..	..	..	..	..
Technology	..	..	..	..	..	..	..	..	..
Forestry	55	54	55	..	..	..	..	..	..
Veterinary Science	674	608	472	..	..	..	..	..	..
Totals	35,662	30,073	10,669	110	104	..	751	637	202
School and Special Education.									
In High Schools	109,835	100,435	9,448	74,791	68,949	2,944	61,827	56,842	1,058
,, Middle Schools { English	12,744	11,633	977	101,729	84,502	3,019	30,952	27,766	220
,, Middle Schools { Vernacular	7,854	6,613	750	610,283	521,615	27,019	19,361	16,958	49
,, Primary Schools	143,175	100,288	1,427	5,096,070	3,920,101	2,591	873,703	712,701	78
Totals.	273,608	218,969	12,602	5,882,873	4,595,167	35,573	985,843	814,267	1,405
In Art Schools	1,609	1,374	56	75	56	..	97	75	..
,, Law ,,	..	..	..	..	..	..	..	..	..
,, Medical Schools	3,758	3,423	1,235	..	..	..	..	..	..
,, Normal and Training Schools.	18,490	16,025	10,702	144	137	144	189	175	4
,, Engineering Schools*	1,673	1,427	935	..	..	..	..	..	..
,, Technical and Industrial Schools.	10,903	8,998	3,904	1,330	1,083	250	555	461	19
,, Commercial Schools	831	697	37	..	..	..	..	..	..
,, Agricultural ,,	452	410	345	32	31	32	..	..	..
,, Reformatory ,,	3,343	2,836	2,986	..	..	..	..	..	..
,, Schools for Defectives	25	22	21	17	12	3	72	59	1
,, Schools for Adults	68,760	53,926	..	3,856	3,125	..	5,038	3,497	..
,, Other Schools	4,877	4,406	1,692	867	729	195	456	319	..
Totals	114,721	93,544	21,913	6,321	5,173	624	6,407	4,586	24
Totals for Recognised Institutions.	423,991	342,586	45,184	5,889,304	4,600,444	36,197	993,001	819,490	1,631
IN UNRECOGNISED INSTITUTIONS.	..	..	..	23,727	16,797	..	1,035	847	..
Grand Totals, all Institutions for Males	423,991	342,586	45,184	5,913,031	4,617,241	36,197	994,036	820,337	1,631

(*a*) Scholars reading more than one of the following subjects should be entered under only one head.
(*b*) Includes 505 scholars also reading *Law*, and 64 students in Orissa reading Law only.
(*c*) Includes 741 scholars in *Oriental Colleges*, and 620 Scholars reading in the Oriental Departments of the Lucknow and Benares Hindu Universities.
*Includes *Survey* School.

Educational Institutions for Males.

Aided.			Unaided.			Grand total of scholars on rolls.	Grand total of average attend-ance.	Grand total of residents in approved hostels.	Number of females included in column 16.
Scholars on roll on March 31st.	Average daily attendance.	No. of residents in approved hostels.	Scholars on roll on March 31st.	Average daily attend-ance.	No. of residents in approved hostels.				
10	11	12	13	14	15	16	17	18	19
78,622	68,414	19,796	23,659	19,176	3,844	126,970	107,879	29,085	6,619
1,828	1,592	513	2,806	2,077	567	5,902	4,682	1,306	21
1,333	1,286	538	..	..	..	5,822	5,168	2,054	564
334	301	212	182	175	55	2,051	1,914	1,239	196
770	690	574	..	..	..	2,564	2,302	1,711	4
508	462	440	119	108	84	1,850	1,752	1,512	..
3,255	2,764	757	2,798	2,231	226	6,849	5,731	1,043	26
445	361	181	..	..	..	445	361	181	1
..	..	..	..	..	..	55	54	55	..
..	..	..	..	..	..	674	608	472	..
87,095	75,870	23,011	29,564	23,767	4,776	153,182	130,451	38,658	7,431
737,969	654,917	46,040	204,782	168,322	10,116	1,189,204	1,049,465	69,606	30,894
345,279	281,797	10,816	89,966	73,104	3,339	580,670	478,802	18,371	25,226
20,189	17,348	2,077	7,206	6,101	613	664,893	568,635	30,508	17,701
4,171,071	3,306,307	8,872	214,768	169,106	222	10,498,787	8,208,503	13,190	1,701,730
5,274,508	4,260,369	67,805	516,722	416,633	14,290	12,933,554	10,305,405	131,675	1,775,551
242	195	26	18	17	..	2,041	1,717	82	123
..	..	..	..	..	..	..	..	..	..
980	851	290	696	633	210	5,434	4,907	1,735	463
3,400	3,192	1,706	633	575	282	22,856	20,104	12,838	150
202	193	6	..	..	..	1,875	1,620	941	..
13,434	11,102	3,823	1,181	1,076	243	27,403	22,720	8,239	305
727	599	50	10,302	8,004	348	11,860	9,300	435	247
252	215	170	14	14	14	750	670	561	..
114	114	114	..	..	..	3,457	2,950	3,100	39
1,753	1,474	801	81	74	37	1,948	1,641	863	485
58,146	45,381	..	55,028	44,103	..	190,828	150,032	..	1,394
149,699	119,133	4,554	21,968	17,313	1,757	177,867	141,900	8,198	6,298
228,949	182,449	11,540	89,921	71,809	2,891	446,319	357,561	36,992	9,504
5,590,552	4,518,688	102,356	636,207	512,209	21,957	13,533,055	10,793,417	207,325	1,792,486
12,068	9,845	..	414,028	282,009	1,444	450,858	309,498	1,444	50,897
5,602,620	4,528,533	102,356	1,050,235	794,218	23,401	13,983,913	11,102,915	208,769	1,843,383

II-B.—Distribution of Scholars attending

	Government.			District Board.			Municipal Board.		
	Scholars on roll on March 31st.	Average daily attendance.	No. of residents in approved hostels.	Scholars on roll on March 31st.	Average daily attendance.	No. of residents in approved hostels.	Scholars on roll on March 31st.	Average daily attendance.	No. of residents in approved hostels.
	1	2	3	4	5	6	7	8	9
Reading—									
IN RECOGNISED INSTITUTIONS. *University and Intermediate Education* (a).									
Arts and Science (b) .	1,218	1,080	349	..	..	..	..	..	..
Medicine . . .	..	..	..	..	..	..	..	..	..
Education . . .	153	146	94	..	..	..	..	..	..
Totals .	1,371	1,226	443	..	..	..	..	..	..
School and Special Education.									
In High Schools . .	25,246	22,252	1,905	460	383	..	3,538	2,795	19
„ Middle Schools { English	4,991	4,186	159	875	640	..	6,339	5,077	..
„ Middle Schools { Vernacular.	22,476	18,665	266	19,863	15,784	137	24,487	19,834	..
„ Primary Schools . .	32,021	26,519	346	426,386	322,991	20	320,256	255,858	39
Totals .	84,734	71,622	2,676	447,584	339,798	157	354,620	283,564	58
In Medical Schools . .	..	..	..	..	..	..	..	..	..
„ Normal and Training Schools.	4,589	4,353	3,418	..	..	..	83	75	4
„ Technical and Industrial Schools.	1,106	763	..	..	..	..	56	50	..
„ Commercial Schools .	..	..	..	..	..	..	..	..	..
„ Agricultural Schools .	..	..	..	..	..	..	..	..	..
„ Schools for Adults .	2,827	2,161	..	153	126	..	55	53	..
„ Other Schools . .	31	31	31	..	..	..	..	..	..
Totals .	8,553	7,308	3,449	153	126	..	194	178	4
Totals for Recognised Institutions.	94,658	80,156	6,568	447,737	339,924	157	354,814	283,742	62
IN UNRECOGNISED INSTITUTIONS.	..	..	..	1,735	1,295	..	1,478	1,248	..
Grand Totals, all Institutions for Females.	94,658	80,156	6,568	449,472	341,219	157	356,292	284,990	62
Grand Totals, all Institutions—Males and Females.	518,649	422,742	51,752	6,362,503	4,958,460	36,354	1,350,528	1,105,327	1,693

(a) Scholars reading more than one of the following subjects should be entered under only one head.
(b) Includes *Nil* scholars in *Oriental Colleges*.

Educational Institutions for Females.

Aided.			Unaided.			Grand total of Scholars on rolls.	Grand total of average attend-ance.	Grand total of residents in approved hostels.	Number of males included in column 16.
Scholars on roll on March 31st.	Average daily attendance.	No. of residents approved hostels.	Scholars on roll on March 31st.	Average daily attend-ance.	No. of residents in approved hostels.				
10	11	12	13	14	15	16	17	18	19
3,193	2,930	870	748	673	138	5,159	4,683	1,357	..
460	391	460	..	..	..	460	391	460	..
158	150	121	142	128	80	453	424	295	..
3,811	3,471	1,451	890	801	218	6,072	5,498	2,112	..
111,442	98,274	14,611	4,058	3,439	565	144,744	127,143	17,100	8,099
59,349	49,269	7,947	6,405	5,548	433	77,959	64,720	8,539	4,474
58,707	50,722	2,100	1,786	1,536	115	127,319	106,541	2,618	937
675,299	548,148	11,866	65,977	51,709	119	1,519,939	1,205,225	12,390	98,026
904,797	746,413	36,524	78,226	62,232	1,232	1,869,961	1,503,629	40,647	111,536
30	30	30	..	..	..	30	30	30	..
4,165	3,976	2,581	428	383	133	9,265	8,787	6,136	78
6,465	5,666	1,466	284	231	84	7,911	6,710	1,550	113
128	89	1	18	17	..	146	106	1	..
57	51	57	..	..	..	57	51	57	..
3,359	2,202	69	..	..	..	6,394	4,542	69	1
7,101	5,801	143	1,154	950	32	8,286	6,782	206	(c) 532
21,305	17,815	4,347	1,884	1,581	249	32,089	27,008	8,049	724
929,913	767,699	42,322	81,000	64,614	1,699	1,908,122	1,536,135	50,808	112,260
785	608	..	97,154	79,452	6	101,152	82,603	6	13,521
930,698	768,307	42,322	178,154	144,066	1,705	2,009,274	1,618,738	50,814	125,781
6,533,318	5,296,840	144,678	1,228,389	938,284	25,106	15,993,187	12,721,653	259,583	..

(c) Includes 67 scholars of Schools for Defectives.

III-A.—Expenditure on

Expenditure on Buildings includes Rs. 22,22,162/- spent by the Public Works Department on educational buildings.
"Miscellaneous" includes the following main items:—
Scholarships, Hostel charges and other contingent charges.

	Government Institutions.					
	Government funds.	Board funds.	Municipal funds.	Fees.	Other sources.	Totals.
	1	2	3	4	5	6
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
University and Intermediate Education.						
Universities	..	..	..	..	..	..
Boards of Secondary and Intermediate Education.	47,549	..	..	4,08,041	1,646	4,57,236
Arts Colleges	35,78,156	..	..	23,35,633	1,71,986	60,85,775
Professional Colleges—						
Law	2,716	..	..	1,67,606	1,013	1,71,335
Medicine	18,68,511	..	..	6,96,162	1,64,347	27,29,020
Education	8,02,886	..	..	2,48,440	8,458	10,59,784
Engineering	9,28,145	..	..	3,32,491	31,635	12,92,271
Agriculture	5,85,882	..	..	1,53,946	938	7,40,766
Commerce	..	..	..	93,929	18,499	1,12,428
Technology	..	..	..	..	..	..
Forestry	1,04,600	..	..	..	..	1,04,600
Veterinary Science	4,23,798	..	..	51,812	12,500	4,88,110
Intermediate Colleges	9,29,804	..	..	3,46,332	10,000	12,86,136
Totals	92,72,047	..	..	48,34,392	4,21,022	1,45,27,461
School Education.						
General.						
High Schools	60,48,568	..	..	29,14,201	49,212	90,11,981
Middle Schools—						
English	5,00,901	..	..	1,94,386	2,429	6,97,716
Vernacular	1,72,623	..	..	4,343	151	1,77,117
Primary Schools	17,04,342	60,721	48,183	5,983	9,504	18,28,733
Totals	84,26,434	60,721	48,183	31,18,913	61,286	1,17,15,547
Special.						
Art Schools	3,05,164	..	..	64,334	3,499	3,72,997
Law Schools	..	..	..	..	..	..
Medical Schools	6,23,794	..	..	3,29,807	19,543	9,73,144
Normal and Training Schools	26,67,425	13,367	1,136	8,493	14,869	27,05,290
Engineering Schools*	2,82,723	..	..	85,322	17,025	3,85,070
Technical and Industrial Schools	18,23,601	12,060	400	1,13,363	4,17,929	23,67,353
Commercial Schools	60,131	..	..	57,822	1,638	1,19,591
Agricultural Schools	89,357	..	..	3,013	364	92,734
Reformatory Schools	4,42,719	..	..	..	4,900	4,47,619
Schools for Defectives	6,346	..	..	..	926	7,272
Schools for Adults	2,33,900	..	..	..	1,660	2,35,560
Other Schools	6,26,930	..	14	38,618	11,056	6,76,618
Totals	71,62,090	25,427	1,550	7,00,772	4,93,409	83,83,248
Grand Totals	2,48,60,571	86,148	49,733	86,54,077	9,75,727	3,46,26,256

*Include *Survey* Schools.

Education for Males

District Board and Municipal Institutions.						Aided Institutions.		
Government funds.	Board funds.	Municipal funds.	Fees.	Other sources.	Totals.	Government funds.	Board funds.	Municipal funds.
7	8	9	10	11	12	13	14	15
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
..	..	..	..	..	..	50,19,126	..	..
..	..	..	..	..	..	..	..	..
..	..	..	..	10,266	10,266	19,37,275	3,050	14,260
..	..	..	..	..	..	..	..	..
..	..	1,55,267	1,18,751	..	2,74,018	15,000	..	..
..	..	..	..	..	..	7,400	..	..
..	..	..	..	..	..	31,700	1,500	..
..	..	..	..	..	..	36,000	..	..
..	..	..	..	..	..	41,580	..	..
..	..	..	..	..	..	33,436	..	..
..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..
4,103	..	5,253	20,723	233	30,312	9,07,634	..	12,859
4,103	..	1,60,520	1,39,474	10,499	3,14,596	80,29,151	4,550	27,119
11,47,955	10,89,307	5,13,892	32,49,969	56,570	60,57,693	68,26,816	61,973	2,54,313
6,51,788	10,06,314	2,85,110	12,67,888	43,218	32,54,318	12,15,072	6,19,203	82,414
59,82,126	21,59,932	2,16,288	11,52,602	36,214	95,47,162	61,183	35,911	4,777
3,15,99,673	1,19,68,810	92,27,589	10,41,526	6,81,656	5,45,19,254	1,14,75,182	31,00,469	6,89,997
3,93,81,542	1,62,24,363	1,02,42,879	67,11,985	8,17,658	7,33,78,427	1,95,78,253	38,17,556	10,31,501
1,000	6,308	1,257	253	3,991	12,809	5,947	408	7,635
..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	14,250	1,500	4,505
20,155	6,220	36,949	..	..	63,324	2,23,534	269	..
..	..	..	..	..	..	2,300	475	200
83,834	82,080	73,788	15,731	48,028	3,03,461	5,04,025	30,446	26,404
..	..	..	..	..	..	6,883	..	394
1,570	7,696	..	..	1,773	11,039	10,214	..	..
..	..	..	..	..	..	14,040	..	..
300	330	4,359	208	40	5,237	88,725	2,279	30,321
19,787	3,454	1,66,739	573	123	1,90,676	1,14,165	11,770	16,583
10,046	2,855	13,600	99,459	1,12,582	2,38,542	8,65,183	2,19,142	47,899
1,36,692	1,08,943	2,96,692	1,16,224	1,66,537	8,25,088	18,49,266	2,66,289	1,33,941
3,95,22,337	1,63,33,306	1,07,00,091	69,67,683	9,94,694	7,45,18,111	2,94,56,670	40,88,395	11,92,615

Direction . . .
Inspection . .
Buildings, etc. . .
Miscellaneous . .

Totals Indirect .

	Aided Institutions.			Recognised unaided Institutions.		
	Fees	Other Sources	Totals.	Fees.	Other sources.	Totals.
	16	17	18	19	20	21
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
University and Intermediate Education						
Universities	72,39,967	31,86,472	1,54,45,565	..	..	..
Boards of Secondary and Intermediate Education.	62,451	..	62,451	..	..	..
Arts Colleges—	61,95,415	16,18,334	97,68,334	16,49,944	2,93,407	19,43,351
Professional Colleges.						
Law	22,713	..	22,713	3,78,186	60,285	4,38,471
Medicine	1,30,914	..	1,45,914	..	..	..
Education	11,828	22,712	41,940	52,823	64,735	1,17,558
Engineering	66,843	35,587	1,35,630	..	..	..
Agriculture	20,075	47,066	1,03,141	6,542	30,781	37,323
Commerce	19,514	4,813	65,907	1,61,794	25,823	1,87,617
Technology	10,995	1,49,856	1,94,287	..	..	..
Forestry	..	..	..	..	..	..
Veterinary Science . . .	..	..	..	..	..	..
Intermediate Colleges . . .	16,41,256	4,73,485	30,35,234	2,77,995	1,44,954	4,22,949
Totals .	1,54,21,971	55,38,325	2,90,21,116	25,27,284	6,19,985	31,47,269
School Education.						
General.						
High Schools	2,11,60,506	40,67,607	3,23,71,215	57,91,429	12,90,831	70,82,260
Middle Schools—						
English	39,81,231	13,41,000	72,38,920	10,58,168	6,24,968	16,83,136
Vernacular	57,746	89,753	2,49,370	25,233	29,597	54,830
Primary Schools	25,61,834	44,97,671	2,23,25,153	1,79,391	5,00,485	6,79,876
Totals .	2,77,61,317	99,96,031	6,21,84,658	70,54,221	24,45,881	95,00,102
Special.						
Art Schools	8,234	6,222	28,446	463	2,395	2,858
Law Schools	..	..	..	..	..	..
Medical Schools	87,602	43,579	1,51,436	1,09,423	6,341	1,15,764
Normal and Training Schools .	50,530	1,26,525	4,00,858	33,000	28,871	66,871
Engineering Schools* . . .	23,222	8,319	34,516	..	..	..
Technical and Industrial schools .	2,99,307	10,47,519	19,07,701	54,737	1,78,006	2,32,743
Commercial Schools	25,009	9,669	41,955	2,66,363	40,297	3,06,660
Agricultural Schools	..	18,665	28,879	..	1,289	1,289
Reformatory Schools	..	1,420	15,460	..	..	..
Schools for Defectives . . .	29,241	1,40,995	2,91,561	24	216	240
Schools for Adults	1,192	36,142	1,79,852	251	19,253	19,504
Other Schools	9,07,341	9,26,803	29,66,368	46,270	3,47,711	3,93,981
Totals .	14,31,678	23,65,868	60,47,032	5,15,531	6,24,379	11,39,910
Grand Totals .	4,46,14,966	1,79,00,214	9,72,52,806	1,00,97,036	36,90,245	1,37,87,281
			Grand Totals (Direct and Indirect). . .			

* Include *Survey* Schools.

Education for Males—contd.

Total Indirect expenditure from					
Government funds. 22	Board funds. 23	Municipal funds. 24	Fees. 25	Other sources. 26	Grand Totals. 27
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
17,55,814	..	..	..	37	17,55,851
76,25,989	4,80,240	3,75,097	21	23,812	85,05,159
42,43,508	16,32,807	4,70,288	10,05,878	55,58,787	1,29,11,268
78,45,876	13,01,389	5,26,604	54,80,148	45,88,454	1,97,42,471
2,14,71,187	34,14,436	13,71,989	64,86,047	1,01,71,090	4,29,14,749

Total Direct expenditure from					
Government funds. 22	Board funds. 23	Municipal funds. 24	Fees. 25	Other sources. 26	Grand Totals. 27
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
50,19,126	..	..	72,39,967	31,86,472	1,54,45,565
47,549	..	..	4,70,492	1,646	5,19,687
55,40,231	3,050	14,260	1,01,80,992	20,69,193	1,78,07,726
2,716	..	..	5,68,505	61,298	6,32,519
18,83,511	..	1,55,267	9,45,827	1,64,347	31,48,952
8,10,286	..	..	3,13,091	95,905	12,19,282
9,59,845	1,500	..	3,99,334	67,222	14,27,901
6,21,882	..	..	1,80,563	78,785	8,81,230
41,580	..	..	2,75,237	49,135	3,65,952
33,436	..	..	10,995	1,49,856	1,94,287
1,04,600	..	..	..	..	1,04,600
4,23,798	..	..	51,812	12,500	4,88,110
18,70,970	..	20,612	22,86,306	5,96,743	47,74,631
1,73,59,530	4,550	1,90,139	2,29,23,121	65,33,102	4,70,10,442
1,40,26,055	11,51,280	7,68,205	3,31,16,105	54,61,504	5,45,23,149
23,76,834	16,27,255	3,67,848	65,01,673	20,00,480	1,28,74,090
62,16,142	21,95,843	2,21,125	12,39,924	1,55,445	1,00,28,479
4,47,80,173	1,51,30,000	99,66,033	37,88,734	56,88,076	7,93,53,016
6,73,99,204	2,01,04,378	1,13,23,211	4,46,46,436	1,33,05,505	15,67,78,734
3,12,111	6,716	8,892	73,284	16,107	4,17,110
..	..	..	..	..	..
6,38,044	1,500	4,505	5,26,832	69,463	12,40,344
29,11,114	19,856	38,085	97,023	1,70,265	32,36,343
2,85,023	475	200	1,08,544	25,344	4,19,586
24,11,460	1,24,586	1,00,592	4,83,138	16,91,482	48,11,258
67,014	..	394	3,49,194	51,604	4,68,206
1,01,141	7,696	..	3,013	22,091	1,33,941
4,56,759	..	..	..	6,320	4,63,079
95,371	2,609	34,680	29,473	1,42,177	3,04,310
3,67,852	15,224	1,83,322	2,016	57,178	6,25,592
15,02,252	2,21,997	61,513	10,91,688	13,98,059	42,75,509
91,48,141	4,00,659	4,32,183	27,64,205	36,50,090	1,64,95,278
9,39,06,875	2,05,09,587	1,19,45,533	7,03,33,762	2,34,88,697	22,01,84,454
11,53,78,062	2,39,24,023	1,33,17,522	7,68,19,809	3,36,59,787	26,30,99,203

III-B.—Expenditure on

Expenditure on buildings includes Rs. 4,69,234/- spent by the Public Works Department on educational buildings.
"Miscellaneous" includes the following main items :—
Scholarships, Hostel charges and other contingent charges.

	Government Institutions.					
	Government funds.	Board funds.	Municipal funds.	Fees.	Other sources.	Totals.
	1	2	3	4	5	6
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
University and Intermediate Education.						
Arts Colleges	3,50,779	..	..	1,15,692	..	4,66,471
Professional Colleges—						
Medicine	..	..	..	..	..	..
Education	94,334	..	..	4,287	..	98,621
Intermediate Colleges	39,798	..	..	16,013	116	55,927
Totals	4,84,911	..	..	1,35,992	116	6,21,019
School Education.						
General.						
High Schools	16,33,100	..	..	4,40,561	7,615	20,81,276
Middle Schools—						
English	1,90,204	..	..	27,090	1,031	2,18,325
Vernacular	4,54,225	..	1,600	29,916	167	4,85,908
Primary Schools	4,97,167	60	52	2,479	460	5,00,218
Totals	27,74,696	60	1,652	5,00,046	9,273	32,85,727
Special.						
Medical Schools	..	..	..	..	..	..
Normal and Training Schools	10,71,391	396	93	1,866	1,261	10,75,,007
Technical and Industrial Schools	80,658	..	..	..	3,431	84,089
Commercial Schools	..	..	..	..	..	..
Agricultural Schools	..	..	..	..	..	..
Schools for Adults	5,071	..	..	..	162	5,233
Other Schools	19,761	..	..	270	..	20,031
Totals	11,76,881	396	93	2,136	4,854	11,84,360
Totals (Direct) for Females	44,36,488	456	1,745	6,38,174	4,243	50,91,106
Totals (Direct) for Males	2,48,60,571	86,148	49,733	86,54,077	9,75,727	3,46,26,256
Grand Totals (Direct) for all	2,92,97,059	86,604	51,478	92,92,251	9,89,970	3,97,17,362

Education for Females

District Board and Municipal Institutions.						Aided Institutions.		
Government funds.	Board funds.	Municipal funds.	Fees.	Other Sources.	Totals.	Government funds.	Board funds.	Municipal funds.
7	8	9	10	11	12	13	14	15
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
..	..	..	..	..	..	99,710	..	..
..	..	..	..	..	..	2,63,673	1,550	7,198
..	..	..	..	..	..	33,635	..	..
..	..	..	..	..	..	1,74,686	1,000	3,689
..	..	..	..	..	..	5,71,704	2,550	10,887
39,616	1,324	1,00,939	52,648	4,666	1,99,193	23,25,464	12,063	1,11,457
44,635	12,254	75,999	27,431	1,074	1,61,393	7,28,974	24,489	95,660
1,89,376	87,846	2,79,950	25,316	3,187	5,85,675	3,17,359	21,435	1,29,634
43,93,884	16,25,977	40,50,586	8,109	34,563	1,01,13,119	20,79,279	4,30,498	3,53,114
46,67,511	17,27,401	45,07,474	1,13,504	43,390	1,10,59,380	54,51,076	4,88,485	6,89,865
..	..	..	..	..	..	3,420	..	..
3,045	..	15,457	..	..	18,502	3,53,886	..	2,833
3,000	..	1,500	500	746	5,746	88,089	1,633	25,350
..	..	..	..	..	..	4,240	..	..
..	..	..	..	..	..	1,080	..	..
529	42	112	..	..	683	24,491	..	1,569
..	..	..	..	..	..	65,367	7,491	2,739
6,574	42	17,069	500	746	24,931	5,40,573	9,124	32,491
46,74,085	17,27,443	45,24,543	1,14,004	44,236	1,10,84,311	65,63,353	5,00,159	7,33,243
3,95,22,337	1,63,33,306	1,07,00.091	69,67,683	9,94,694	7,45,18,111	2,94,56,670	40,88,395	11,92,562
	1,80,60,749	1,52,24,634	70,81,687	10,38,930	8,56,02,422	3,60,20,023	45,88,554	19,25,804

III-B.—Expenditure on

Inspection . . .
Buildings, etc. . .
Miscellaneous . .

Totals Indirect .

	Aided Institutions.			Recognised Unaided Institutions.		
	Fees.	Other sources.	Totals.	Fees.	Other sources.	Totals.
	16	17	18	19	20	21
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
University and Intermediate Education.						
Arts Colleges	1,90,214	1,38,227	4,28,151	67,090	62,017	1,29,107
Professional Colleges—						
Medicine	48,490	76,713	3,97,624	..	..	..
Education	16,855	18,415	68,905	12,525	..	12,525
Intermediate Colleges . .	1,49, 006	63,480	3,91,861	52,331	17,692	70,023
Totals	4,04,565	2,96,835	12,86,541	1,31,946	79,709	2,11,655
School Education.						
General.						
High Schools	36,74,380	17,46,757	78,70,121	1,78,922	1,56,003	3,34,925
Middle Schools—						
English	5,86,084	6,87,146	21,22,353	68,404	1,58,681	2,27,085
Vernacular	1,08,442	4,11,679	9,88,549	790	20,370	21,160
Primary Schools . . .	4,90,014	14,92,407	48,35,312	21,471	1,28,465	1,49,936
Totals	48,48,920	43,37,989	1,58,16,335	2,69,587	4,63,519	7,33,106
Special.						
Medical Schools . . .	3,080	33,626	40,126	..	..	..
Normal and Training Schools .	83,775	2,65,746	7,06,240	36,453	38,488	74,941
Technical and Industrial Schools .	43,831	2,64,089	4,22,992	1,652	12,945	14,597
Commercial Schools . . .	17,234	20	21,494	293	906	1,199
Agricultural Schools . . .	..	1,100	2,180	..	..	..
Schools for Adults . . .	3,164	11,423	40,647	..	..	..
Other Schools	43,478	1,11,675	2,30,750	12,428	26,933	39,361
Totals	1,94,562	6,87,679	14,64,429	50,826	79,272	1,30,098
Totals (Direct) for Females .	54,48,047	53,22,503	1,85,67,305	4,52,359	6,22,500	10,74,859
Totals (Direct) for Males .	4,46,14,966	1,79,00,214	9,72,52,806	1,00,97,036	36,90,245	1,37,87,281
Grand Totals (Direct) for all .	5,00,63,013	2,32,22,717	11,58,20,111	1,05,49,395	43,12,745	1,48,62,140

Grand Totals (Direct and Indirect) for Females . . . . . .

Grand Totals (Direct and Indirect) for Males. . . . . .

Grand Totals (Direct and Indirect) for all. . . . . .

Education for Females—contd.

Total Indirect expenditure from					
Government funds.	Board funds.	Municipal funds.	Fees.	Other sources.	Grand Totals.
22	23	24	25	26	27
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
12,20,062	4,193	85,463	2,018	5,648	13,17,384
11,45,813	81,741	1,57,613	1,07,383	12,54,586	27,47,136
17,43,471	88,538	1,63,646	18,75,951	17,26,633	55,98,239
41,09,346	1,74,472	4,06,722	19,85,352	29,86,867	96,62,759

Total Direct expenditure from					
Government funds.	Board funds.	Municipal funds.	Fees.	Other sources.	Grand. Totals.
22	23	24	25	26	27
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
4,52,089	..	..	3,72,996	1,98,644	10,23,729
2,63,673	1,550	7,198	48,490	76,713	3,97,624
1,27,969	..	..	33,667	18,415	1,80,051
2,24,034	1,000	5,089	2,17,350	70,338	5,17,811
10,67,765	2,550	12,287	6,72,503	3,64,110	21,19,215
39,98,180	13,387	2,12,396	43,46,511	19,15,041	1,04,85,515
9,63,813	36,743	1,71,659	7,09,009	8,47,932	27,29,156
9,60,960	1,09,281	4,11,184	1,64,464	4,35,403	20,81,292
69,70,630	20,56,535	44,03,752	5,12,073	16,55,595	1,55,98,585
1,28,93,583	22,15,946	51,98,991	57,32,057	48,53,971	3,08,94,548
3,420	..	..	3,080	33,626	40,126
14,28,322	396	18,383	1,22,094	3,05,495	18,74,690
1,71,747	1,633	26,850	45,983	2,81,211	5,27,424
4,240	..	..	27,527	926	22,693
1,080	..	..	..	1,100	2,180
30,091	42	1,681	3,164	11,585	46,563
85,128	7,491	2,739	56,176	1,36,608	2,90,142
17,24,028	9,562	49,653	2,48,024	7,72,551	28,03,818
1,56,85,376	22,28,058	52,60,931	66,52,584	59,90,632	3,58,17,581
9,39,06,875	2,05,09,587	1,19,45,533	7,03,33,762	2,34,88,697	22,01,84,454
10,95,92,251	1,27,37,645	1,72,06,464	7,69,86,346	2,94,79,329	25,60,02,035
1,97,94,722	24,02,530	56,67,653	86,37,936	89,77,499	4,54,80,340
11,53,78,062	2,39,24,023	1,33,17,522	7,68,19,809	3,36,59,787	26,30,99,203
13,51,72,784	2,63,26,553	1,89,85,175	8,74,57,745	4,26,37,286	30,85,79,543

IV-A.—Race or Creed of Male Scholars receiving Vocational and Special Education.

	Anglo-Indians and Europeans.	Indian Christians.	Hindus.	Muhammadans.	Buddhists.	Parsis.	Sikhs.	Others.	Total.	No. of pupils from Rural Areas.	Total No. of married pupils	No. of married pupils of and above the age of 18 years.
	1	2	3	4	5	6	7	8	9	10	11	12
Total Population	128,769	1,837,725	(h) 99,532,287	41,715,893	84,622	52,265	2,290,875	7,458,686	(i) 153,101,122	..	..	..
School Education.												
Classes												
Primary I	3,988	72,229	2,250,874	1,417,598	8,122	1,197	40,925	66,228	3,861,161	3,229,944	21,879	422
II	2,673	45,259	1,369,308	562,455	3,139	816	25,411	38,079	2,047,140	1,613,444	26,201	378
III	2,342	36,491	1,094,946	388,554	1,779	871	22,447	30,477	1,577,907	1,250,162	30,617	498
IV	2,380	32,431	895,662	283,764	1,190	846	20,011	23,863	1,260,147	944,403	32,269	677
V	2,158	29,356	663,880	161,810	595	837	14,337	13,892	886,865	617,030	29,332	1,108
*Middle VI	2,127	14,061	369,2[illegible]0	98,164	489	927	11,877	8,669	505,514	328,554	20,452	1,174
VII	1,842	10,805	279,631	69,253	329	928	8,055	6,395	377,238	227,746	19,118	2,086
VIII	1,509	9,927	248,117	58,422	271	766	6,785	5,018	330,815	180,077	24,193	4,692
*High IX	1,173	4,917	122,524	32,164	246	805	4,263	2,555	168,647	74,697	6,246	1,958
X	1,024	3,915	107,373	27,310	205	683	3,291	2,133	145,934	63,742	6,750	2,942
XI	459	3,008	63,265	9,164	28	538	104	1,523	78,165	25,767	5,314	2,730
XII	61	674	24,698	3,658	1	723	48	928	30,791	12,250	4,127	2,176
Totals	21,736	263,149	7,489,478	3,112,316	16,394	9,937	157,554	199,760	(f) 11,270,324	8,567,816	226,498	20,841

University and Intermediate Education

Intermediate classes—												
1st year	235	1,116	28,409	6,638	66	298	1,196	480	38,438	13,251	2,270	1,810
2nd year	161	920	27,239	6,751	70	264	971	408	36,784	12,924	2,654	2,318
Degree classes—												
1st year	51	534	13,127	3,198	23	124	513	225	17,795	5,117	1,920	1,853
2nd year	53	425	12,654	3,107	38	107	471	195	17,050	5,827	2,195	2,131
3rd year	5	27	438	188	..	..	22	9	(a)689	(b)212	(c)68	(c)68
Post-graduate classes—												
1st year	10	77	2,827	631	7	24	76	36	3,688	1,346	1,057	1,054
2nd year	12	61	2,347	516	7	22	64	37	3,066	1,200	985	976
Research students	..	16	268	68	..	21	2	4	379	89	164	163
Totals .	527	3,176	87,309	21,097	211	860	3,315	1,394	(d) & (g) 119,039	(e) 40,804	11,313	10,373
No. of scholars in recognised institutions.	22,263	266,325	7,576,787	3,133,413	16,605	10,797	160,869	201,154	11,389,363	8,608,620	237,811	31,214
No. of scholars in unrecognised institutions.	259	4,105	180,746	206,020	745	341	4,952	16,314	413,482	323,962	23,852	13,818
GRAND TOTALS .	22,522	270,430	7,757,533	3,339,433	17,350	11,138	165,821	217,468	11,802,845	8,932,582	261,663	45,032

* Please draw two broad lines across the table indicating the stages where the High and Middle Departments begin. (These lines could not be drawn as there is no uniformity in the different provinces as to the stages where the High and Middle departments begin).

(a) Includes 10 students (2 Hindus, 5 Muhammadans and 3 Sikhs) in the 4th year class in N.W.F.Province.

(b) Includes 3 students in the 4th year class in N.W.F. Province.

(c) Includes 1 student in the 4th year class in N.W.F. Province.

(d) Includes 1 Indian Christian, 977 Hindus, 168 Muhammadans, 1 Sikh and 3 Others in the United Provinces not shown in details.

(e) Includes 838 students who reside in rural areas in the United Provicnes not shown in details.

(f) Excludes 78 pupils reading purely classical language in Assam and 20 students of the Mercara Hindustani School and the District Board Primary School, Sanivaisante in Coorg reading Carpentry and Weaving only.

(g) Excludes 204 students in the Oriental College in the Punjab, 64 students reading Law in Orissa, 91 students in the B.T. class of St. Edmunds' College in Assam and 32 Premedical students of Science college in Bihar, also excludes 597 and 286 students reading in school stages in colleges in the Punjab and Assam, respectively.

(h) Includes figures for 'Ad-dharmis in the Punjab.

(i) Excludes 99; 65,761 and 31,551 persons not enumerated by religion in the Administered Areas in the Gwalior Residency, Hyderabad and Central India Agency, respectively.

IV-B.—Race or Creed of Female Scholars receiving General Education.

	Anglo-Indians and Europeans.	Indian Christians.	Hindus.	Muhammadans.	Buddhists.	Parsis.	Sikhs.	Others.	Total.	No. of pupils from Rural Areas.	Total No. of married pupils	No. of married pupils of and above the age of 14 years.
	1	2	3	4	5	6	7	8	9	10	11	12
Total Population.	100,845	1,776,003	(d) 93,928,520	37,716,913	80,304	50,174	1,873,651	7,342,142	(e) 142,868,552	..	..	..
School Education. Classes.												
Primary I	4,105	63,448	1,034,334	520,514	2,346	1,196	18,909	19,463	1,664,315	1,221,861	5,844	225
II	2,727	35,230	466,605	152,570	880	755	8,415	9,296	676,478	456,008	4,677	295
III	2,503	26,100	323,891	81,287	529	779	6,706	7,454	449,249	277,238	5,088	403
IV	2,453	21,406	228,055	47,821	278	849	5,122	5,371	311,355	176,051	5,194	639
V	2,235	17,895	146,947	23,512	146	730	3,383	3,214	198,062	101,429	3,820	825
Middle VI	2,164	10,333	60,747	7,497	82	900	1,514	1,995	85,232	25,567	1,691	851
VII	1,925	8,028	41,699	4,905	61	823	1,220	1,352	60,013	14,102	1,435	922
VIII	1,487	7,283	31,284	3,680	30	714	979	904	46,361	10,470	1,476	1,061
High IX	1,017	2,848	11,908	1,285	5	626	323	352	18,364	1,552	478	318
X	727	1,919	8,828	984	12	509	226	201	13,406	1,143	395	309
XI	376	1,219	5,288	303	..	385	26	159	7,756	596	243	204
XII	53	237	2,592	89	..	360	4	137	3,472	141	130	120
Totals .	21,772	195,946	2,362,178	844,447	4,369	8,626	46,827	49,898	(a) 3,534,063	2,286,158	30,471	6,172

University and Intermediate Education												
Intermediate classes—												
1st year	88	479	2,715	348	3	142	101	37	3,913	449	104	102
2nd year	70	419	2,416	297	2	137	69	37	3,447	283	163	146
Degree classes—												
1st year	44	259	1,284	175	2	77	52	12	1,905	177	86	85
2nd year	30	225	1,162	136	1	82	50	20	1,706	197	115	113
3rd year	1	14	26	..	..	2	2	..	45	..	2	2
Post-graduate classes—												
1st year	8	31	266	22	..	16	5	3	351	10	37	26
2nd year	1	9	204	24	..	10	10	2	260	11	25	25
Research students	..	1	15	3	..	9	..	..	28	..	4	4
Totals .	242	1,437	8,088	1,005	8	475	289	111	(*b*) & (*c*) 11,659	1,127	536	503
No. of scholars in recognised institutions.	22,014	197,383	2,370,266	845,452	4,377	9,101	47,116	50,009	3,545,722	2,287,285	31,007	6,675
No. of scholars in unrecognised institutions.	163	2,034	41,020	87,943	50	95	3,683	3,540	138,528	102,975	2,397	1,072
GRAND TOTALS .	22,177	199,417	2,411,286	933,395	4,427	9,196	50,799	53,549	3,684,250	2,390,260	33,404	7,747

(*a*) Excludes 7 girls reading purely vocational course in Assam.
(*b*) Includes 1 Hindu and 3 Muhammadans of Oriental Department of Lucknow University in the United Provinces not shown in details.
(*c*) Excludes 3 girls in the Oriental College in the Punjab, 4 Pre-Medical students of Science College in Bihar, and 18 students of Training class attached to St. Mary's College in Assam, also excludes 94 students reading in school stages in colleges in the Punjab.
(*d*) Includes figures for 'Ad-dharmis' in the Punjab.
(*e*) Excludes 65; 61,049 and 24,846 persons not enumerated by religion in the Administered Areas in the Gwalior Residency, Hyderabad and Central India Agency, respectively

V-A.—Race or Creed of Male Scholars receiving Vocational and Special Education.

	Anglo-Indians and Europeans.	Indian Christians.	Hindus.	Muhammadans.	Buddhists.	Parsis.	Sikhs.	Others.	Total.	No. of pupils from Rural Areas.	Total No. of married pupils.	No. of married pupils of and above the age of 18 years.
	1	2	3	4	5	6	7	8	9	10	11	12
School Education.												
Art Schools	3	77	1,518	222	1	36	31	30	1,918	456	129	114
Law Schools	..	..	..	..	..	..	..	..	..	..	..	..
Medical Schools	3	61	3,971	650	10	7	112	157	4,971	1,117	861	831
Normal and Training Schools	3	2,590	14,750	5,121	16	2	89	213	22,784	17,724	11,342	10,914
Engineering and Surveying Schools	3	34	1,338	411	1	14	56	18	1,875	738	159	158
Technical and Industrial Schools	172	2,599	18,127	5,162	69	253	374	475	(a) 27,231	9,734	3,584	3,219
Commercial Schools	83	880	9,464	722	1	216	66	181	11,613	2,074	1,458	1,429
Agricultural Schools	..	131	504	113	..	1	1	..	750	505	123	121
Reformatory Schools	4	136	2,166	949	1	..	17	145	3,418	1,138	91	52
Schools for Defectives	11	264	1,027	177	..	16	9	86	1,530	406	6	4
Schools for Adults	..	1,263	95,530	85,301	61	..	864	6,338	189,357	169,266	113,813	104,507
Other Schools	59	301	60,747	109,092	1,163	24	267	506	(b)172,159	137,656	25,118	18,165
Totals	341	8,336	209,142	207,920	1,323	569	1,886	8,089	437,606	340,814	156,684	139,514
University and Intermediate Education.												
Law	2	66	4,839	747	2	42	72	175	(c) 5,945	2,156	1,753	1,747
Medicine	123	217	3,952	603	1	90	89	183	5,258	1,271	1,014	1,010
Education	44	119	1,388	348	..	6	63	16	(d) 1,984	558	1,122	1,122
Engineering	29	94	1,725	345	2	63	68	62	(e) 2,388	445	211	211
Agriculture	3	53	1,431	265	4	2	76	16	1,850	1,254	205	192
Commerce	3	53	5,928	401	1	130	13	294	6,823	2,662	840	818
Technology	..	7	381	46	..	6	1	3	444	88	67	67
Forestry	..	..	36	16	..	..	3	..	55	26	28	28
Veterinary Science	4	22	370	217	4	..	56	1	674	450	138	138
Totals	208	631	20,050	2,988	14	339	441	750	25,421	8,910	5,378	5,333
GRAND TOTALS	549	8,967	229,192	210,908	1,337	908	2,327	8,839	463,027	349,724	162,062	144,847

(a) Includes 20 students of the Mercara Hindusthani School and the District Board Primary School, Saniversante in Coorg (shown under School Education, General 'Primary School' in Table II-A); reading carpentry and Weaving only.

(b) Includes 47 pupils reading Sanskrit in secularised Primary Schools in Assam and also 78 pupils in C. P. and Berar (shown under School Education, specail—'Schools for Adults' in Table II-A).

(c) Includes 64 students in Orissa (shown against 'Arts and Science' in Table II-A) reading Law only.

(d) Includes 91 students in the B. T. class of St. Edmund's College in Assam (shown against 'Arts and Science' in Table II-A).

(e) Excludes 172 students not reading the University course in Bihar.

V-B.—Race or Creed of Female Scholars receiving Vocational and Special Education.

	Anglo-Indians and Europeans.	Indian Christians.	Hindus.	Muhammadans.	Buddhists.	Parsis.	Sikhs.	Others.	Total.	No. of pupils from Rural Areas.	Total No. of married pupils	No. of married pupils of and above the age of 14 years.
	1	2	3	4	5	6	7	8	9	10	11	12
School Education.												
Medical Schools	7	81	315	50	2	7	25	6	493	57	26	2
Normal and Training Schools	255	3,593	4,153	1,038	14	64	115	105	9,337	3,904	2,130	2,073
Technical and Industrial Schools	65	1961	4,508	886	19	383	160	121	8,103	1,286	1,342	1,328
Commercial Schools	192	82	32	1	..	61	..	25	393	1	13	13
Agricultural Schools	..	51	..	..	..	..	..	6	57	57	..	..
Schools for Adults	..	171	5,403	1,215	..	31	19	948	7,787	3,825	3,518	3,274
Other Schools	86	707	3,865	9,582	218	52	8	181	14,699	2,526	571	532
Totals	605	6,646	18,276	12,772	253	598	327	1,392	40,869	11,656	7,600	7,246
University and Intermediate Education.												
Medicine	50	270	446	128	1	50	56	23	1,024	72	88	88
Education	106	111	303	77	..	15	40	15	(a) 667	54	104	104
Law	..	3	12	1	..	5	..	..	21	..	..	..
Engineering	..	2	2	..	..	..	..	..	4	..	1	1
Agriculture	..	..	..	..	..	..	..	..	..	..	..	..
Commerce	1	1	12	..	..	12	..	..	26	..	2	
Technology	..	..	1	..	..	..	..	..	1	..	..	..
Totals	157	387	776	206	1	82	96	38	1,743	126	195	195
GRAND TOTALS	762	7,033	19,052	12,978	254	680	423	1,430	42,612	11,782	7,795	7,441

(a) Includes 18 students of Training class attached to St. Mary's College in Assam.

VI-A.—Men Teachers.

Class of Institutions.	Trained Teachers with the following educational qualifications					Untrained Teachers.				Total Trained Teachers.	Total Untrained Teachers.	Grand totals of Teachers.
						Possessing a degree.		Possessing no degree.				
	A Degree.	Passed Matric or School Final.	Passed Middle School.	Passed Primary School.	Lower qualifications.	Certificated.	Uncertificated.	Certificated	Uncertificated.			
	1	2	3	4	5	6	7	8	9	10	11	12
Primary Schools.												
Government	40	458	2,360	1,002	16	1	1	78	522	3,876	602	4,478
Local Board and Municipal	234	9,505	90,423	31,009	467	151	69	7,516	40,333	131,638	48,069	179,707
Aided	150	6,897	59,658	9,991	289	73	163	18,369	57,987	76,985	76,591	153,576
Unaided	2	96	932	167	10	2	6	1,836	5,525	1,207	7,369	8,576
Totals	426	16,956	153,373	42,169	782	227	239	27,798	104,367	213,706	132,631	346,337
Middle Schools.												
Government	85	397	327	27	6	26	17	21	51	842	115	957
Local Board and Municipal	669	2,800	20,075	667	189	101	186	1,077	3,330	24,400	4,694	29,094
Aided	520	2,562	4,356	99	171	272	738	2,900	7,206	7,708	11,116	18,824
Unaided	196	618	957	38	24	89	264	720	2,335	1,833	3,408	5,241
Totals	1,470	6,377	25,715	831	390	488	1,205	4,718	12,922	34,783	19,333	54,116
High Schools.												
Government	2,729	1,016	696	62	120	114	321	235	536	4,623	1,206	5,829
Local Board and Municipal	2,171	1,914	526	44	809	173	170	192	676	5,474	1,211	6,675
Aided	8,881	5,493	2,159	186	1,055	2,886	4,469	3,280	6,598	17,774	17,233	35,007
Unaided	994	622	435	11	14	1,760	2,142	1,938	2,701	2,076	8,541	10,617
Totals	14,775	9,045	3,816	303	1,998	4,933	7,102	5,645	10,511	29,937	28,191	58,128
Grand Totals	16,671	32,378	182,904	43,303	3,170	5,648	8,546	38,161	127,800	278,426	180,155	458,581

VI-B.—Women Teachers.

Class of Institutions.	Trained Teachers with the following educational qualifications.					Untrained Teachers.				Total Trained Teachers.	Total Untrained Teachers.	Grand totals of Teachers.
						Possessing a degree.		Possessing no degree.				
	A degree.	Passed Matric or School Final.	Passed Middle School.	Passed Primary School.	Lower qualifications.	Certificated.	Uncertificated.	Certificated	Uncertificated.			
	1	2	3	4	5	6	7	8	9	10	11	12
Primary Schools.												
Government	6	138	739	302	9	..	..	16	227	1,194	243	1,437
Local Board and Municipal	16	658	9,115	5,953	107	60	19	919	6,008	15,849	7,006	22,855
Aided	87	1,362	9,143	1,771	76	30	42	1,609	6,176	12,439	7,857	20,296
Unaided	2	15	117	52	1	6	8	150	803	187	967	1,154
Totals	111	2,173	19,114	8,078	193	96	69	2,694	13,214	29,669	16,073	45,742
Middle Schools.												
Government	49	201	583	120	10	16	4	78	88	963	186	1,149
Local Board and Municipal	32	125	873	167	9	17	14	190	430	1,206	651	1,857
Aided	211	921	1,860	192	33	111	126	431	1,391	3,217	2,059	5,276
Unaided	27	64	66	15	1	4	37	50	201	173	292	465
Totals	319	1,311	3,382	494	53	148	181	749	2,110	5,559	3,188	8,747
High Schools.												
Government	344	416	312	10	48	42	53	37	47	1,130	179	1,309
Local Board and Municipal	48	66	39	5	9	14	8	15	24	167	61	228
Aided	1,300	2,193	476	104	109	314	529	368	981	4,182	2,192	6,374
Unaided	43	76	11	9	2	7	43	16	67	141	133	274
Totals	1,735	2,751	838	128	168	377	633	436	1,119	5,620	2,565	8,185
Grand Totals	2,165	6,235	23,334	8,700	414	621	883	2,879	16,443	40,848	21,826	62,674

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VII—Anglo-Indian and European Education.

Total Anglo-Indian and European Population	Male	128,769
	Female	100,845
	Total	229,614

Percentage to Anglo-Indian and European population of those at school.

Males.	Females.	Total.
20·98	26·48	23·40

	Institutions.	Scholars on roll on March 31st.	Number of females in institutions for males and *vice versa*.	Number of Non-Europeans on roll.	Teachers. Trained.	Teachers. Untrained.	Direct expenditure from Govt. funds.	Direct expenditure from Local funds.†	Direct expenditure from Fees.	Direct expenditure from Other sources.	Total expenditure.
	1	2	3	4	5	6	7	8	9	10	11
Institutions for Males.							Rs.	Rs.	Rs.	Rs.	Rs.
Arts Colleges	7	640	..	253	76	8	2,01,628	..	2,42,819	92,087	5,36,534
Training Colleges	1	14	..	..	(*a*)	(*a*)	12,927	..	..	..	12,927
High Schools	69	17,812	1,910	3,880	784	337	9,64,904	6,707	17,99,524	8,50,084	36,21,219
Middle Schools	30	4,109	1,208	748	193	48	2,18,783	1,538	1,27,855	1,42,253	4,90,429
Primary Schools	45	2,840	860	592	142	38	77,174	810	1,06,454	94,104	2,78,542
Training Schools	..	..	..	..	..	..	..	..	..	..	..
Technical and Industrial Schools	..	..	..	..	..	..	..	..	..	..	..
Commercial Schools	..	..	..	..	..	..	..	..	..	..	..
Other Schools	..	..	..	..	..	..	(*b*)6,604	..	..	..	(*b*)6,604
Totals	152	25,415	3,978	5,473	1,195	431	14,82,020	9,055	22,76,652	11,78,528	49,46,255
Institutions for Females.											
Arts Colleges	..	..	..	..	..	..	..	..	..	..	..
Training Colleges	2	84	..	1	12	..	28,130	..	14,544	6,138	48,812
High Schools	103	19,610	3,163	4,404	1,195	320	11,17,452	21,868	14,22,578	4,46,068	30,07,966
Middle Schools	41	4,139	1,046	827	246	72	1,88,764	2,373	1,46,921	1,18,114	4,56,172
Primary Schools	53	3,954	1,368	1,057	154	79	93,990	5,775	1,09,279	1,17,666	3,26,710
Training Schools	8	251	2	27	35	4	22,590	..	22,759	51,237	96,493
Technical and Industrial Schools	1	70	..	20	7	2	1,750	..	..	2,888	4,638
Commercial Schools	3	128	..	12	7	1	4,240	..	17,234	20	21,494
Other Schools	4	71	5	..	3	4	14,568	..	1,560	8,769	24,897
Totals	214	28,307	5,584	6,348	1,659	482	14,71,394	30,016	17,34,875	7,50,900	39,87,185
Grand Totals for institutions	366	53,722	..	11,821	2,854	913	29,53,414	39,071	40,11,527	19,29,428	89,33,440
Indirect expenditure											
Inspection							1,14,175	..	..	..	1,14,175
Buildings, etc.							2,69,990	..	1,86,408	7,20,507	11,76,905
Miscellaneous							10,66,568	1,380	22,29,671	17,18,213	50,15,832
Totals (Indirect)							14,50,733	1,380	24,16,079	24,38,720	63,06,912
Grand Totals (Direct and Indirect)							44,04,147	40,451	64,27,606	43,68,148	1,52,40,352

Expenditure on Buildings includes Rs. 21,056 spent by the Public Works Department.

"Miscellaneous" includes the following main items:—
Scholarships, Hostel Charges and other Contingent charges.

*The term "non-Europeans" does not include Anglo-Indian and domiciled Europeans.

†Include both District Board and Municipal Funds.

(*a*) The teachers of the Lawrence College, Ghoragali, have teaching periods with the Chelmsford Training College, Ghoragali, in the Punjab.

(*b*) This expenditure relates to European Special subjects training Centre (in Madras) which has no pupils of its own.

VIII.—Examination Results.

Examinations.	Males.						Females.					
	Number of Examinees.			Number Passed.			Number of Examinees.			Number passed.		
	Public*.	Private.	Total.	Public*.	Private.	Total.	Public.*	Private.	Total.	Public.*	Private.	Total.
	1	2	3	4	5	6	7	8	9	10	11	12
DEGREE EXAMINATIONS.												
Arts and Science.												
D. Litt.	1	(a) 6	7	1	1	2	..	..	..	..	..	..
Ph. D.	35	16	51	35	12	47	4	..	4	3	..	3
D. Sc.	3	9	12	3	8	11	..	..	..	..	..	..
M. Litt.	..	10	10	..	5	5	..	1	1	..	1	1
M. A.	2,178	788	2,966	1,757	557	2,314	218	73	291	170	54	224
M. Sc.	556	45	601	455	26	481	14	3	17	13	2	15
B. A. (Honours)	2,254	106	2,360	1,664	55	1,719	385	35	420	307	15	322
B. Sc. (Honours)	531	73	604	399	38	437	17	..	17	13	..	13
B. A. (Pass)	12,664	4,715	17,379	6,974	1,829	8,803	1,284	977	2,261	899	500	1,399
B. Sc. (Pass)	4,307	483	4,790	2,588	198	2,786	123	22	145	83	12	95
Law.												
Master of Law	25	27	52	9	4	13	..	..	..	..	..	..
Bachelor of Law	2,894	422	3,316	1,731	250	1,981	23	8	31	9	2	11
Medicine‡												
M. D.	35	13	48	8	3	11	33	3	36	23	3	26
M. B. B. S.	1,505	3	1,508	722	..	722	139	..	139	83	..	83
L. M. S.	..	..	..	..	..	..	..	..	..	..	..	..
M. C. P. & S. (Bombay)	..	..	..	..	..	..	..	..	..	..	..	..
M. S. M. F. (Calcutta)†	18	..	18	8	..	8	..	..	..	..	..	..
D. G. M. S. (Bombay)	26	..	26	10	..	10	..	..	..	..	..	..
M. S.	31	7	38	8	4	12	1	..	1	1	..	1
M. Obstetrics	..	..	..	..	..	..	..	..	..	..	..	..
D. Hyg.	..	..	..	..	..	..	..	..	..	..	..	..
B. Hyg.	2	..	2	..	..	..	..	..	..	..	..	..
D. P. H.	49	..	49	27	..	27	..	..	..	..	..	..
D. O.	7	..	7	1	..	1	..	..	..	..	..	..
B. Sc. (Sanitary)	..	5	5	..	4	4	..	..	..	..	..	..
D. T. M. (Calcutta)	2	61	63	1	51	52	..	6	6	..	6	6

(a) The result of 1 candidate in Bombay is awaited.
*i.e. appearing from a recognised institution.
†Represents figures for M. M. F. (Bengal).

‡The result of the following examinations are not included :— D. G. O. in Bombay (2 males appeared and 1 passed, 1 female appeared but failed) and B. D. S. in the Punjab (12 males appeared and 8 passed).

VIII.—Examination Results—*contd.*

Examinations.	Males.						Females.					
	Number of Examinees.			Number Passed.			Number of Examinees.			Number passed.		
	Public*.	Private.	Total.	Public*.	Private.	Total.	Public.*	Private.	Total.	Public.*	Private.	Total.
	1	2	3	4	5	6	7	8	9	10	11	12
Engineering.†												
Master of E. E.	..	..	..	..	..	..	..	..	..	..	..	..
Bachelor of E. E.	136	5	141	65	..	65	..	..	..	..	..	..
Bachelor of C. E.	310	5	315	228	1	229	..	..	..	..	..	..
Bachelor of M. E.	98	2	100	70	1	71	..	..	..	..	..	..
Bachelor of Mining and Metallurgy	32	..	32	21	..	21	..	..	..	..	..	..
Education.												
M. Ed.	9	1	10	9	1	10	1	..	1	..	..	..
B. E., B. T. & L. T.	1,303	388	1,691	1,096	255	1,351	366	106	472	304	72	376
Commerce.‡												
Master of Commerce	19	..	19	18	..	18	2	..	2	1	..	1
Bachelor of Commerce	1,773	269	2,042	925	108	1,033	6	1	7	3	1	4
Technology.												
Master of Technology	13	..	13	13	..	13	..	..	..	..	..	..
Bachelor of Technology	21	..	21	14	..	14	..	..	..	..	..	..
Agriculture.												
Master of Agriculture	2	10	12	2	6	8	..	..	..	..	..	..
Bachelor of Agriculture	483	23	506	375	13	388	..	..	..	..	..	..
INTERMEDIATE EXAMINATIONS.												
Intermediate of Arts	27,610	9,343	36,953	15,627	3,891	19,518	2,978	2,371	5,349	2,088	1,313	3,401
Intermediate in Science	10,717	1,265	11,982	6,080	591	6,671	449	97	546	280	43	323
Licentiate of Civil Engineering**	180	7	187	132	3	135	..	..	..	..	..	..
Licence, Diploma or Certificate in Teaching	2,372	62	2,434	1,513	44	1,557	1,004	15	1,019	739	10	749
Intermediate or Diploma in Commerce	1,777	101	1,878	1,012	32	1,044	2	..	2	..	..	..
Licentiate of Agriculture	454	1	455	348	1	349	..	..	..	..	..	..
Veterinary Examinations	359	..	359	294	..	294	..	..	..	..	..	..

School Examinations.												
(a) On completion of High School course.												
Matriculation	82,237	14,208	96,445	54,281	6,662	60,943	5,935	4,700	10,635	4,117	2,435	6,552
School Final etc.††	42,115	8,160	50,275	34,888	4,125	39,013	3,176	1,869	5,045	2,823	759	3,582
Anglo-Indian and European High School	242	..	242	193	..	193	205	..	205	178	..	178
Cambridge School Certificate‡‡	1,062	100	1,162	725	20	745	728	30	758	607	13	620
(b) On completion of Middle School course.												
Cambridge Junior	994	..	994	696	..	696	845	3	848	622	3	625
Anglo-Indian and European Middle	336	..	336	259	..	259	332	..	332	284	..	284
Anglo-Veenacular-Middle	117,717	11,097	128,814	97,317	8,626	105,943	12,426	744	13,170	10,205	482	10,687
Vernacular Middle§	91,856	13,030	104,886	55,430	5,858	61,288 (a)	14,026	2,718	16,744	8,545	1,524	10,069 (b)
(c) On completion of Primary course.												
Upper Primary	386,665	4,535	391,200	308,703	2,379	311,082	41,178	1,291	42,469	31,504	691	32,195
Lower Primary	753,958	142	754,100	614,959	131	615,090	112,423	164	112,587	91,176	110	91,286
(d) On completion of Vocational course.												
For teacher's certificates—												
Vernacular, Higher	10,192	5,298	15,490	7,238	1,391	8,629	4,664	985	5,649	3,321	363	3,684
Vernacular, Lower	6,854	1,005	7,859	6,264	496	6,760	1,138	145	1,283	1,003	75	1,078
At Art Schools	1,126	45	1,171	799	27	826	118	11	129	84	5	89
At Law Schools	..	..	..	..	..	..	..	..	..	..	..	..
At Medical Schools	2,549	27	2,576	1,280	19	1,299	378	..	378	251	..	251
At Engineering Schools‖	870	452	1,322	676	227	903	..	3	3	..	1	1
At Technical and Industrial Schools	4,037	1,247	5,284	3,374	433	3,807	775	627	1,402	648	418	1,066
At Commercial Schools	2,404	7,940	10,344	1,498	2,942	4,440	82	74	156	42	29	71
At Agricultural Schools	85	..	85	80	..	80	63	..	63	50	..	50
At Other Schools	87,576	1,395	88,971	67,715	900	68,615	3,703	130	3,833	2,583	83	2,666

i.e., appearing from a recognised institution.

†Including the Diploma Examination of the Thomason Civil Engineering College, Roorkee.

‡The result of Bachelor of Commerce (Honours) examination in Madras was 27 males appeared and 25 passed.

**Includes figures for Final Civil Engineering (Diploma) examination in C. P. and Berar.

‖Include Survey Schools.

††Includes figures for High School examination in the United Provinces; also includes figures that completed the S.S.L.C. Course in Madras.

‡‡In the Cambridge High Certificate examination 7 males appeared and 4 passed, 9 females appeared and 6 passed in the United Provinces.

§Includes figures for M.E. School examination in Bihar and Orissa; also includes candidates who failed in English only in the Anglo-Vernacular Middle Course but passed the Vernacular papers, are declared to have passed the Vernacular Middle examination.

(a) Includes 78 candidates who appeared for Anglo-Vernacular Middle examination in Orissa.

IX.—Statistics of Educational

Types of Institutions.	No. of Institutions and Scholars.							
	Government.		District Board.		Private.		Total.	
	Institutions.	Scholars.	Institutions.	Scholars.	Institutions.	Scholars.	Institutions.	Scholars.
1	2	3	4	5	6	7	8	9
I. Recognised Institutions. *For Males.*								
Arts Colleges	2	192	1	110	30	6,997	33	7,299
Professional Colleges	3	662	..	..	..	(a) 19	3	681
High Schools	24	5,471	153	57,261	1,454	335,225	1,631	397,957
Middle Schools	47	5,322	4,754	661,469	3,516	340,529	8,317	1,007,320
Primary Schools	2,357	115,559	66,724	4,890,398	73,840	3,804,380	142,921	8,810,337
Training Schools	287	16,302	7	144	45	3,192	339	19,638
Agricultural Schools	6	215	1	32	6	266	13	513
Schools for Adults	2,068	63,533	145	3,875	3,666	100,264	5,879	167,672
Other Schools	56	2,286	22	696	2,564	131,638	2,642	134,620
Totals	4,850	209,542	71,807	5,613,985	85,121	4,722,510	161,778	10,546,037
For Females.								
Arts Colleges	..	..	..	..	..	..	..	..
Professional Colleges	..	..	..	..	..	..	..	..
High Schools	2	488	..	..	18	3,774	20	4,262
Middle Schools	13	1,081	125	12,313	166	20,581	304	33,975
Primary Schools	204	11,455	6,539	398,619	12,506	545,191	19,249	955,265
Training Schools	69	3,015	..	..	55	2,463	124	5,478
Agricultural Schools	..	..	..	..	2	57	2	57
Schools for Adults	111	2,606	1	20	28	679	140	3,305
Other Schools	1	33	..	..	60	4,636	61	4,669
Totals	400	18,678	6,665	410,952	12,835	577,381	19,900	1,007,011
Grand Totals for all Recognised Institutions.	5,250	228,220	78,472	6,024,937	97,956	5,299,891	181,678	11,553,048
II. Unrecognised Institutions.								
For Males							12,380	369,464
For Females							3,727	89,856
Totals							16,107	459,320
Grand Totals for all Institutions.							197,785	12,012,368

(a) Scholars in the Panlits' Training class of the Annamalai University.

Institutions in Rural Areas.

Expenditure on Institutions.				No of Teachers.			
From Government Funds.	From District Board Funds.	From other Sources.	Total expenditure.	In Government Institutions.	In District Board Institutions	In Private Institutions.	Total.
10	11	12	13	14	15	16	17
Rs.	Rs.	Rs.	Rs.				
4,73,022	15,300	12,91,391	17,79,713	19	11	515	545
2,99,686	..	1,62,572	4,62,258	95	..	..	95
,53,627	11,43,088	1,19,01,813	1,58,98,528	367	3,025	17,102	20,494
70,77,044	41,05,815	62,15,896	1,73,98,755	274	24,037	17,222	41,533
3,63,57,780	1,66,22,769	70,32,026	6,00,12,575	3,956	146,352	133,511	283,819
27,47,973	15,318	2,49,311	30,12,602	1,028	21	342	1,391
50,644	7,696	25,199	83,539	17	3	31	51
3,11,283	14,527	24,726	3,50,596	2,060	113	3,484	5,657
10,90,815	2,75,031	15,04,626	28,70,472	136	39	7,607	7,782
5,12,61,874	2,21,99,604	2,84,07,560	10,18,69,038	7,952	173,601	179,814	361,367
..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..
1,16,771	1,095	2,10,207	3,28,073	23	..	243	266
3,82,348	1,04,604	3,14,920	8,01,872	61	479	1,076	1,616
38,07,848	19,72,263	7,00,694	64,80,805	450	12,712	18,733	31,895
8,98,188	396	1,81,868	10,83,452	267	..	291	558
1,080	..	1,100	2,180	..	..	4	4
6,914	21	222	7,157	111	1	28	140
60,616	4,553	79,604	1,44,773	3	..	264	267
52,73,765	20,82,932	14,91,615	88,48,312	915	13,192	20,639	34,746
5,65,35,639	2,42,82,536	2,98,99,175	11,07,17,350	8,867	186,793	200,453	396,113

Explanatory notes:—

(1) Figures for *urban* areas (i.e., municipal, cantonment, notified and small town committee areas) are excluded from this table.

(2) The expenditure on institutions includes expenditure on buildings and miscellaneous charges incurred on the schools.

(3) The total number of pupils from rural areas, who are under instruction, is shown in the last column of Tables IV—A and B and V—A and B.

(4) This table includes statistics relating to *training schools*, whether situated in urban or in rural areas, in which the majority of the students are being trained for employment in *rural* areas. It does not include the returns of training institutions located in rural areas, the majority of the students in which are trained for schools in *urban* areas.

X.—Scholars by Classes and Ages in Institutions for General Education (*Quinquennial.*)

Class	Primary.*					Middle.*			High.*				Totals.
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.			
Ages—													
Below 5 . . .	61,685	3,544	265	43	..	..	..	..	..	..	..	..	65,537
5 to 6	1,121,826	82,661	6,908	1,440	694	14	4	..	..	..	..	..	1,213,547
6 to 7. . . .	2,041,924	422,656	68,801	14,177	3,586	213	60	3	..	..	..	..	2,551,420
7 to 8	1,149,943	749,682	280,611	66,441	16,805	2,262	363	36	1	..	..	..	2,266,090
8 to 9	625,305	651,632	502,451	204,741	53,218	10,165	2,246	480	52	2	..	..	2,050,292
9 to 10	305,163	406,371	496,678	365,326	144,188	32,582	9,466	2,550	339	72	..	..	1,762,735
10 to 11	136,689	225,558	316,589	372,741	225,430	85,273	26,916	9,560	1,522	295	60	6	1,400,639
11 to 12	51,993	106,771	194,349	267,329	251,330	127,569	63,187	24,824	5,471	1,140	340	23	1,094,326
12 to 13	18,651	47,423	93,315	151,028	189,268	133,162	93,431	55,004	15,487	4,733	1,343	156	803,001
13 to 14	7,201	16,508	39,556	75,578	110,053	96,281	93,893	80,194	33,703	12,768	4,157	823	570,715
14 to 15	2,342	6,122	17,152	32,463	52,979	55,455	69,389	78,404	45,085	29,018	9,418	2,469	400,296
15 to 16	972	2,197	6,089	12,582	23,282	28,598	41,771	57,154	33,070	38,315	16,138	4,870	270,038
16 to 17	490	943	2,080	4,658	8,491	12,184	21,272	35,103	23,710	34,232	18,008	6,464	167,635
17 to 18	280	445	1,014	1,505	3,150	4,357	9,713	18,842	13,279	19,186	14,425	7,165	93,361
18 to 19	185	280	492	674	1,332	1,698	3,483	9,025	6,307	11,302	10,176	6,107	50,061
19 to 20	144	198	221	286	543	578	1,341	3,930	2,682	5,529	6,542	3,556	25,550
Over 20 . . .	683	681	585	490	578	355	716	2,067	1,303	2,748	5,314	3,624	19,144
Totals .	5,525,476	2,723,618	2,027,156	1,571,502	1,084,927	590,746	437,251	377,176	187,011	159,340	85,921	34,263	14,804,387

*Please draw lines indicating the number of classes or years comprising the different stages of instruction.

X.—Scholars by classes and Ages in Institutions for General Education *Quinquennial*—contd.

Class	Intermediate.*		Degree.*			Post Graduate.*		Totals.	Grand Totals.
	1st year.	2nd year.	1st year.	2nd year.	3rd year.	1st year.	2nd year.		
Ages—									
Below 5	..	..	..	..	..	..	..	..	65,537
5 to 6	..	..	..	..	..	..	..	..	1,213,547
6 to 7	..	..	..	..	..	..	..	..	2,551,420
7 to 8	..	..	..	..	..	..	..	..	2,266,090
8 to 9	..	..	..	..	..	..	..	..	2,050,292
9 to 10	..	..	..	..	..	..	..	..	1,762,735
10 to 11	..	..	..	..	..	..	..	..	1,400,639
11 to 12	1	..	..	..	..	..	..	1	1,094,327
12 to 13	17	1	..	..	..	..	..	18	803,019
13 to 14	139	30	4	..	..	..	..	173	570,888
14 to 15	1,595	250	17	..	..	..	..	1,862	402,158
15 to 16	5,889	1,207	131	22	..	2	..	7,251	277,289
16 to 17	9,041	5,497	665	159	5	8	..	15,375	183,010
17 to 18	9,115	10,016	2,788	721	28	64	14	22,746	116,107
18 to 19	7,416	8,595	4,551	2,617	91	210	79	23,559	73,620
19 to 20	4,632	7,119	4,578	4,283	125	311	173	21,221	46,771
Over 20	4,504	7,514	6,960	10,939	485	3,482	3,284	37,168	56,312
Totals	(a) 42,349	(b) 40,229	(c) 19,694	(d) 18,741	734	4,077	(e) 3,550	(f) 129,374	14,933,761

(a) Excludes 2 pupils of the Government Sanskrit College in Assam whose ages are not available.
(b) Excludes 2 pupils of the Government Sanskrit College in Assam whose ages are not available.
(c) Excludes 6 pupils of the Government Sanskrit College in Assam whose ages are not available.
(d) Excludes 15 pupils of the Government Sanskrit College in Assam whose ages are not available.
(e) Excludes 167 and 16 research students in the United Provinces and the Punjab, respectively.
(f) Excludes 1,154 students of Oriental Departments of Lucknow and Benares Hindu Universities and Benares Sanskrit College in U.P. also includes 25 pupils in Assam [*vide* footnotes (a) to (d)] and also 183 research students [*vide* footnote (e)].

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DEVELOPMENT

OF

HIGHER TECHNICAL INSTITUTIONS IN INDIA

(INTERIM REPORT OF SARKER COMMITTEE)

CX. O. 38.

FEBRUARY, 1946

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1946

AN INTERIM REPORT OF THE COMMITTEE APPOINTED TO CONSIDER THE DEVELOPMENT OF HIGHER TECHNICAL INSTITUTIONS IN INDIA.

To

Hon'ble Sirdar Sir JOGENDRA SINGH,

Member of the Viceroy's Executive Council,

Departments of Education, Health and Agriculture,

New Delhi.

SIR,

In view of the certainty of an appreciable increase in the demand for higher specialists in Industry, a rapid expansion in the facilities of Higher Technical Education is a pressing necessity. It is evident that apart from any other considerations, the calls of reconstruction in Europe and elsewhere, and the enormous industrial and Governmental undertakings contemplated in Europe and America to provide full employment, will make it difficult, if not impossible, to secure from abroad, the services of the right type of engineers, architects, technologists and planners etc. to carry out India's post-war projects. The initiation of a programme of higher technical education and research in India should therefore be pushed forward with the utmost speed and determination.

Although the Committee have not as yet completed their labours, in view of the extreme urgency of the situation they submit, an interim report, for your consideration and express the hope that the Committee's recommendations will be given effect to with the least possible delay.

CX-0-38.

DEVELOPMENT OF HIGHER TECHNICAL INSTITUTIONS IN INDIA

PART I

Interim Report of the Committee appointed by the Hon'ble Member of the Viceroy's Executive Council, Departments of Education, Health and Agriculture, to consider the development of Higher Technical Institutions in India.

I.—TERMS OF REFERENCE

(1) With a view to ensuring an adequate supply of technical personnel which will be required for post-war industrial development in this country, to consider whether it is desirable to have (*a*) a central institution possibly on the lines of the Massachusetts Institute of Technology, with a number of subordinate institutions affiliated to it, or (*b*) several higher institutions on a regional basis, or (*c*) any other organisation.

(2) In the light of the conclusions which may be arrived at in regard to item (1), to consider,

(*i*) the scope and size of the proposed institution or institutions ;

(*ii*) the situation of the institution or institutions ;

(*iii*) the control and management of the institution or institutions ;

(*iv*) the qualifications and conditions of service of the teachers to be employed therein and the best way of recruiting them ;

(*v*) the preparation of the necessary plan and specification for buildings and equipments ;

(*vi*) the cost involved ; and

(*vii*) other relevant questions relating to the establishment of such an institution/institutions and its/their future development.

II.—LIST OF MEMBERS

Mr. N. R. SARKER, ' Ranjani ' 237, Lower Circular Road, Calcutta (*Chairman*).

1. Dr. NAZIR AHMED, Office of the Indian Tariff Board, 1st Marine Street, Kalbadevi, Bombay 2.

2. Dr. Sir S. S. BHATNAGAR, Director, Council of Scientific and Industrial Research, New Delhi.

3. Major General D. R. DUGUID, Director of Military Engineering, Master General of Ordnance Branch, G. H. Q., New Delhi.

4. Mr. P. J. EDMUNDS, Chief Engineer, Posts and Telegraphs Department, New Delhi.

(Mr. N. F. FROME took Office after Mr. EDMUNDS' retirement.)

5. Dr. Sir J. C. GHOSH, Director, Indian Institute of Science, Bangalore.

6. Mr. H. K. KIRPALANI, Industrial Adviser to the Government of India, Planning and Development Department, New Delhi.

7. Mr. W. W. Ladden, C/o Messrs. Simpson & Co., Madras.

8. Mr. S. Lall, I.C.S., Additional Secretary, Labour Department, New Delhi.

9. Mr. G. L. MEHTA, 7, Wellesley Place, Calcutta.

10 Dr. A. H. PANDYA, 12, Raja Santosh Road, Alipore, Calcutta.

11. Dr. M. D. PAREKH, Delhi Cloth and General Mills, Ltd. Co., Delhi.

12. Mr. C. E. PRESTON, Principal, Osmania Technical College, Hyderabad (Dn.).

13. Mr. W. G. W. REID, Director, Mechanical Engineering, Railway Board, New Delhi.

14. Dr. Sir John Sargent, Educational Adviser to the Government of India, New Delhi.

15. Mr. A. D. SHROFF, Bombay House, Fort, Bombay.

16. Sardar Bahadur Sir SOBHA SINGH, 1-A, Queensway, New Delhi.

17. Mr. J. K. SRIVASTAVA, The New Victoria Mills, Cawnpore.

18. Sir Frederic Tymms, Director of Civil Aviation in India, Posts and Air Department, New Delhi.

19. Dr. K. VENKATARAMAN, Director, Department of Chemical Technology, University of Bombay, Bombay.

20. Mr. DHARMA VIRA, I.C.S., Deputy Secretary, Department of Industries and Supplies, New Delhi.

21. Mr. W. W. WOOD, Principal, Delhi Polytechnic, Delhi.

22. Brigadier R. D. T. WOOLFE, Controller General of Inspection, M. G. O. Branch, G.H.Q., New Delhi.

Dr. S. R. SEN GUPTA, Assistant Educational Adviser to the Government of India, New Delhi (*Secretary*).

III.—INTRODUCTION

3. The Committee are of opinion that the existing facilities for higher technical education in India are inadequate, both in quantity and quality, to satisfy India's post-war needs for high grade technologists. Although the Committee appreciate that under normal circumstances they might perhaps have undertaken, as an approach to their task, a survey, and examination of the existing facilities, they are of the opinion that the needs of the present situation are so apparent and urgent that a solution cannot be deferred pending such a survey which would necessarily take a considerable time.* The Committee, however, recognise the necessity of conducting such a survey before a final decision is reached as to the organisation and structure of Higher Technical Education in the country as a whole, and in particular, the relation of each new institution with those which already exist.

* Please see note a of dissent from Dr. Nazir Ahmad :—Part II.

IV.—SUMMARY OF THE MAIN RECOMMENDATIONS

(*i*) Not less than four Higher Technical Institutions, one in the North, one in the East, one in the South and one in the West will be necessary to satisfy the post-war requirements.

(*ii*) The one in the East should be set up in or near Calcutta at an early date.

(*iii*) Establishment of the Western Institution which should be in or near Bombay should be taken in hand concurrently with the Eastern Institution or failing that as soon after as possible.

(*iv*) To satisfy the immediate needs for engineers generally and for those with specialised training in Hydraulics in particular, the engineering nucleus of the Northern Institution should be set up without delay.

(*v*) To ensure the proper planning of buildings, equipment and courses of study, the Principal and Heads of the Main Departments of these institutions should be appointed and the services of an architect with experience in the planning of technical institution secured at a sufficiently earl y stage.

V.—NUMBER OF HIGHER TECHNICAL INSTITUTIONS REQUIRED.

5. The question to be settled is whether the anticipated requirements of post-war industrial development in higher technical personnel can be best met by,

(*a*) one Higher Central Technical Institution, possibly on the lines of the Massachusetts Institute of Technology with a number of secondary institutions affiliated to it, or

(*b*) several Higher Institutions of equal status on regional basis, or

(*c*) any other organisation.

After thorough discussion the Committee come to the conclusion that in view of the size of India, and the location of her industries, the provision of several higher technical institutions, on regional basis is the solution most likely to satisfy the post-war requirements. The Committee is of opinion that not less than four Higher Technical Institutions, one in the North, one in the East, one in the South and one in the West will be necessary. Such a distribution of Centres would conform with the geographical position of industrial areas as well as with location of the great majority of existing technical institutions and would be the most equitable and effective in the interest of India as a whole.

VI.—RELATION OF PROPOSED HIGHER TECHNICAL INSTITUTIONS TO SPECIALISED INSTITUTIONS AND TO TECHNOLOGICAL DEPARTMENTS OF UNIVERSITIES.

6. The Committee realise that if the proposed higher technical institutions are to fulfill their intended functions efficiently they must be able to draw upon students with the appropriate training. This involves both the establishment of junior technical institutions in each region and an increase in the number of Technical High Schools. These matters will no doubt receive attention from the All India Council for Technical Education when this Committee's report is considered by them.

7. The Committee recognise the importance, in the interest of efficiency and economy, of co-ordinating the facilities to be provided in the proposed Higher Technical Institutions with those already available or likely to be provided in specialised Technical or Research Institutions and with the Technological (including applied science) Departments of the Universities. The Committee feel that the exact nature of this organisation can only be settled in consultation with the authorities concerned. However, they recommend, as a general principle, that while each Higher Technical Institution should provide instruction up to the graduate stage

in all the main technical subjects likely to be of use to the region which it is designed to serve, it should leave post-graduate instruction in the subjects concerned to specialised institutions where such exist and are capable of satisfying the anticipated demands. Moreover, the Committee suggest that the extent of the provision to be made in each subject at the under-graduate stage should also be determined after careful consideration of the contribution which can be made by existing institutions (including Universities) in the region.

VII.—LOCATION OF THE INSTITUTIONS.

8. It is considered to be of fundamental importance that a right relationship between the public, industry and education should be established and maintained. For this reason, the Committee feel that the proposed institutions should be located so as to be within easy reach of large industrial areas, even though climatic conditions may not altogether be favourable.

VIII.—ORDER OF ESTABLISHMENT OF THE PROPOSED HIGHER TECHNICAL INSTITUTIONS.

9. In view of the time that must inevitably elapse before the products of these institutions are available for employment, the Committee would urge the establishment, of all four institutions as speedily as possible. They recognise, however, that apart from the question of buildings, the difficulties of obtaining the requisite staff and equipment under existing circumstances may make it necessary to establish only one in the first instance and proceed with the others as soon as circumstances permit. They have carefully examined the question whether the first institution should be in the East or the West, and have come finally to the conclusion that if for the reasons given above it is necessary to proceed with one institution only then that in the East should have the priority. In view however of the important industrial developments in Bombay and neighbouring areas, they feel that the Western Institution should be taken in hand concurrently with the Eastern or failing that as soon after as possible.

10. The Committee further recommend that, to satisfy the immediate needs for engineers and particularly those with special training in Hydraulics the engineering nucleus of the Northern Institution should also be set up without delay (Please see paragraph 14).

IX.—CERTAIN OTHER PROPOSALS.

11. Having reached the general conclusions, the main Committee appointed a sub-committee consisting of

Dr. John Sargent (Convener)
Dr. Naz'r Ahmad.
Dr. Sir S. S. Bhatnagar.
Dr. Sir J. C. Gosh
Mr. H. K. Kirpalani.
Dr. A. H. Pandya.
and Dr. K. Venkataraman.

to explore subsidiary issues and prepare schemes in detail. Before proceeding to this task, the sub-committee felt it necessary to have regard to certain other proposals for projects for technical development which were brought to their attention.

12. Representations have been received both from the Military and Civil Authorities as to the urgent need for increasing the supply of trained engineer and in this connection it has been suggested that the establishment of a Central Engineering College is a matter of the utmost importance. It appears that the Central Public Works Department alone will require annually 40 to 50 Civil Engineers with specialised training in Hydraulics and that though Military Engineering requirements at the under-graduate stage will be met by the proposed Indian Military Academy, the Military Authorities will require about 20 post-graduate seats a year in Engineering and Technology.

13. Since a project such as the establishment of a Central Engineering College has an obvious bearing on the issues referred to this Committee, it was felt desirable to discuss the matter in detail with those directly interested. The following were accordingly invited to meet the Sub- Committee :

(*i*) Lt. General Sir Thomas Hutton, Secretary to the Planning and Development Department who has also called attention from the point of view of his Department to the shortage of high class engineers.

(*ii*) Mr. A. W. H. Dean, Chief Engineer, Central Public Works Department.

(*iii*) General Sir Clarence Bird, who, when Master General of Ordnance first raised the question.

(*iv*) Lt. General K. M. Loch, Master General of Ordnance, General Headquarters accompanied by

(*v*) Major General D. R. Duguid, Director of Military Engineering, General Headquarters.

(*vi*) Major General H. M. Roome, Engineer-in-Chief General Headquarters.

(*vii*) Brigadier R. D. T. Woolfe, Controller General of Inspection, General Headquarters.

14. As a result of these discussions it was agreed that the requirements of the Central Public Works Department mentioned above might very well be met by the proposed Higher Technical Institutions provided it did not mean delay. Since however the establishment of an all-round fully developed Higher Technical Institution may involve some delay, it has been suggested that in order to meet these and other urgent needs, special provision for training of high grade engineers should be made as quickly as possible at some convenient Centre in the North of India, say near Cawnpore. This should not be regarded as a separate college but should be absorbed in and become the engineering department of the proposed Northern Higher Technical Institution when established.

15. The questions were considered whether the time lag involved in turning out technical graduates from new Higher Technical Institutions would not retard the rapid growth of industries and whether the needs of industries could not perhaps, be satisfied most effectively and expeditiously by institutions designed to cater for specific industries, and wherever practicable conducted in the main by them, rather than by the omnibus institutions of the type under reference. A note submitted by Brigadier Woolfe in this connection is annexed in Part III. As a result of considerable discussion, the Committee came to the conclusion that the probable demands of industries for High Grade Technical personnel (Executives, research workers, maintenance engineers and teachers) except in so far they will be supplied by the

existing institutions mentioned in para 6, would, of necessity, have to be met through the proposed Higher Technical Institutions, while the demands for lower grade technicians could be met by the junior Technical institutions of the less advanced type that would be linked to the Higher Technical Institutions.

16. The Committee is definitely of the opinion that the establishment of Higher Technical Institutions for undergraduate study (on modern lines and on a par with what obtains abroad) and for post-graduate study and research, facilities for which are almost non-existent in India, cannot be delayed.

17. A proposal from the Rampur State to the effect that Rampur might be considered as a possible location for one of the Higher Technical Institutions was considered. For the reasons stated in paragraph 8 the Committee regret that the claims of Rampur to be a suitable location for a Higher Technical Institution such as they envisage can not be regarded as comparable with those of a large industrial Centre such as Cawnpore. The Committee is, however, of opinion that the Technical Institution proposed to be set up by the Rampur State should develop into a Polytechnic to be linked with the Northern Higher Technical Institution when established.

X.—SCOPE AND SIZE OF THE PROPOSED INSTITUTION†

18. The Committee have devoted considerable attention to the nature and standard of instruction to be provided in the proposed institutions. It is felt that as a number of technical graduates far in excess of the output of the existing colleges would be required for post-war industrial and Governmental projects, it is necessary to provide under-graduate instruction in the main branches of Technology. Further in view of the fact that facilities for post-graduate study and research in Engineering and Technology are totally inadequate in this country it is also necessary that these institutions should produce research workers and technical teachers.

19. The length of under graduate courses at each Higher Technical Institution should be four years and the minium standard for admission I. Sc. or the Higher Secondary Examination when the Intermediate course no longer exists. Selection for admission should be made purely on merit and no provincial quotas should be allotted, but some proportion of the seats should be reserved for the educationally backward classes so that in due course the general level of education throughout may be raised.* The standard for graduation should be not lower than that at a first class institution abroad for example B.Sc. (Tech.) of Manchester or B.S. of the Massachusetts Institute of Technology.

20. It is not possible to lay down any definite length for the post-graduate course. It may normally be of 1 or 2 years' duration though in the case of certain subjects and of students aspiring to higher degrees after research, it may be considerably longer.

21. The proportion of Undergraduate to post-graduate students should be 2 : 1.

22. The subjects in which courses should be provided at each stage should be determined individually for each Higher Technical Institution in relation to ascertained needs and in the light of the considerations set out in paragraph 6. As an indication of what they have in mind the Committee have worked out in some detail the under-

† NOTE.—This is only a tentative view not unanimously subscribed to by the members of the Committee and will receive further consideration.

graduate basic courses which they think should be provided at the Eastern and the Western Higher Technical Institutions and the approximate number of students for which provision should be made in the Eastern Institution at the under-graduate stage. The results, which should be regarded as provisional, are set out below.

XI.—THE EASTERN OR CALCUTTA INSTITUTION.

23. *Location.*

For reasons explained in paragraph 3 the Eastern Institution should be located as near Calcutta as possible, say within a radius of 20 miles, and preferably on the Hooghly.

24. *Scope and Size.*

(*i*) *Basic Under-graduate Courses.*—The approximate number of successful students to be turned out annually is shown in Brackets against each subject :—

Aeronautical Engineering	(40)
Chemical Engineering	(60)
Civil and Sanitary Engineering	(40)
Electrical Engineering	(60)
Mechanical Engineering	(60)
Architecture (Building construction & Town Planning)	(60)
Metallurgy	(20)
Botany	(10)
Meteorology	(10)
Geology and Geophysics	(20)

*Industrial Administration, Industrial Hygiene and Economics.

*Humanities

*Mathematics and Statistics.

*Chemistry.

*Physics.

(*ii*) Administration should take care of physical welfare of students and maintain industrial co-operation.

(*iii*) *Post-graduate Courses.*—The numbers in each subject cannot be fixed at this stage though the total number should be roughly half the under-graduate enrolment. It is not contemplated that Post-graduate students will be recruited exclusively from those who have graduated from the Higher Technical Institutions. Places should be available for suitably qualified graduates from other institutions both in the region and outside. Courses to be provided are :—

Fuel Engineering or Technology.

Pharmaceuticals and Fine Chemicals.

Regional Planning.

Paper Technology.

Glass and Ceramics (in co-operation with the proposed Glass and Ceramics Institute).

Plastics.

Paints and Pigments.

Hydraulic and River Research.

*It is not proposed to provide instruction leading upto a special degree in the subject.

Transportation (including Railway Engineering).
Structural Engineering (including High Dams).
Design of Electrical Machinery.
Refrigeration and Air-conditioning.
Automobile Engineering.
Machine Tools.
Design of machinery and Instruments.
Light alloys.
Industrial Physics.
Electronics (including radio engineering).
Economic Botany.
Geophysics, Geology, Mineralogy.
Meteorology.
Food Technology.

(Post-graduate training in Aeronautical Engineering to be given in the Indian Institute of Science, Bangalore and/or abroad.)

(*iv*) *Size of the Institution.*—With a four year course, the effective number of under-graduates ought to be 1520. To allow for wastage and future expansion, plan should be drawn for an under-graduate student-body of 2000 and for 1000 seats in post-graduate departments.

XII.—THE WESTERN OR BOMBAY INSTITUTION.

25. *Location.*

The institution should be located near Bombay.

26. *Scope.*

(*i*) *Basic Under-graduate Courses.*—At the Bombay Institution the Basic courses to be provided are :—

Building construction and architecture.
Chemical Engineering.
Civil and Sanitary Engineering.
Electrical Engineering.
Geology and Geophysics.
Mechanical Engineering.
Textile Technology (including Designing).
Metallurgy.
Naval Architecture and Marine Engineering.
*Industrial Administration, Industrial Hygiene and Economics.
*Humanities.
*Mathematics and Statistics.
*Physics.
*Chemistry.
*Botany.

*It is not proposed to provide instruction leading upto a special degree in the subject.

(*ii*) *Special Subjects.*—Special Subjects for post-graduate teaching and research at this institution should be :—

Regional Planning.
Pharmaceuticals and Fine Chemicals.
(in co-operation with Bombay University, if possible).
Cellulose Industries (in co-operation with Bombay University if possible).
Plastics, Paints and Pigment (Do.)
Dye Chemistry (Do.)
Food Technology (Do.)
Transportation (including Railway Engineering).
Structural Engineering (including High Dams).
Design of Electrical Machinery.
Refrigeration and Air conditioning.
Design of Machinery and Instruments.
Textile Manufacturing.
Textile Engineering.
Textile Chemistry (in co-operation with Bombay University, if possible).
Light alloys.
Naval Architecture and Marine Engineering.
Economic Botany.
Hydraulic and River Research.

XIII.—ENGINEERING NUCLEUS OF THE NORTHERN INSTITUTION.

27. *Location.*

The Engineering Nucleus of the Nothern Institution, if possible, should be located somewhere near Cawnpore to cater for the requirements for engineers in particular of the Central Public Works Department for Civil Engineers with specialised knowledge in Hydraulics. The Master General of Ordnance has agreed to explore the possibility for finding a suitable building which may serve temporarily for this purpose.

28. *Scope.*

Instruction should be given in the following subjects :—

Civil and Sanitary Engineering ; Applied Mechanics*; Hydraulics* ; Mechanical Engineering*; Electrical Engineering* ; Geology* ; Industrial Administration, Industrial Hygiene, and Economics* ; Humanities* ; Mathematics* ; Chemistry* and Physics*.

29. *Size.*

To ensure an annual output of about 50 civil engineers provision will have to be made for about 250 seats at this Nucleus.

* It is not proposed to provide instruction leading up to a special degree in the subject.

XIV.—CONTROL AND MANAGEMENT OF THE INSTITUTIONS.

30. The management of each institution should be entrusted to a small governing body composed of persons with the requisite variety of qualifications and experience. Governing Bodies should be appointed by the Government in consultation with the All-India Council for Technical Education which has now been set up.

31. In order to enable these institutions to grant degrees and diplomas it may be necessary to establish these by statute as corporate bodies.

XV.—STAFF.

32. In fixing the number of teachers required the Committee took into account the fact that teachers would be expected to do only so much teaching work as would leave them sufficient leisure for research work, for which they should be given all reasonable facilities.

33. *Establishment.*

(*a*) The strength of teaching staff (exclusive of laboratory assistants and demonstrators) to be provided should be fixed in the scale of 1 teacher per 10 students for basic courses and 1 teacher per 5 students for instruction in special subjects.

(*b*) At least two Professors would be required in each large (or major) department.

(*c*) If necessary, the Principal (or Director or President) and some Heads of Departments may have to be appointed with special personal pay.

(*d*) One of the Heads of Department should act as Vice-Principal in addition to his normal duties.

34. *Scales of Pay.*

(*a*) The Committee strongly recommend that salaries should be sufficiently attractive to attract and keep capable men inspite of the inevitable competition from industry.

(*b*) The following scales of pay are recommended :

	Rupees.
For Principal	3,000/- p.m.
For Head of Deptt. including Deptt. incharge of organising practical training	1,500/- to 2,000/- p.m.
Professor	1,000/- to 1,500/- p.m.
Registrar	Do.
Assistant Professor	600–40–1,000/- p.m.
Librarian	Do.
Lecturer	300–30–600/- p.m.

In addition to his pay as the Head of a Department, the Vice-Principal should be given a special allowance.

35. *Qualifications.*

All teachers should have high academic qualifications and practical experience or research experience.

XVI.—BUILDINGS AND EQUIPMENT.

36. In accordance with the most modern practice abroad, the buildings should be constructed round the equipment and not *vice versa*. Secondly, the construction should be sufficiently flexible to allow not only for future extensions but also for alterations in room space from time to time to meet changes in requirements.

37. The Committee are of the opinion that to ensure that these principles are observed the persons who are to hold the posts of Principal and Heads of the main departments of the proposed institutions should be appointed at a sufficiently early stage for their advice to be available and their wishes made known to the architects and others responsible for the planning and equipment.

38. With regard to the actual preparation of plans doubts were expressed whether an open competition would produce the desired result. The general view was that careful enquiry should be directed to secure an architect with up-to-date experience in the planning of technical institutions and appoint him at the same time as the Principal and Heads of major departments.

XVII.—COST INVOLVED.

39. In view of what has been stated above in regard to the size and scope of institutions the Committee feel that they can only make a very approximate forecast of the estimate of cost, recurring and non-recurring, of each of these proposed institutions.

40. An approximate idea of the expenditure which may have to be incurred in each of these institutions may be seen from the the annexed Memorandum (Part IV) on the establishment of the Eastern Higher Technical Institution prepared by the Secretary. In this Memorandum will be found notes on general principle in the design of under-graduate courses of study of work shop and practical training, methods of achieving efficiency of instruction, on education requirements, etc., as well as to detailed calculations of capital and recurring expenditure.

41. It will be seen that probable initial capital expenditure on apparatus, machine tools, furniture, laboratory, buildings, etc., will come to about Rupees three crores as summarised below :

	Rupees.
(1) Land Acquisition	8,00,000
(2) Water, Supply, Sewage Plant Roads, etc.	15,00,000
(3) College Building	55,13,500
(4) Equipment	1,02,30,000
(5) Furniture	9,40,000
(6) Students Hostel	66,30,000
(7) Staff Quarters	53,30,000
Total ..	3,09,43,500

42. While the recurring expenditure will come to about Rupees 68 lacs as shown below :—

	Rupees.
Salaries, Provident Fund	29,35,000
Other Charges	23,01,000
Interest, etc.	15,43,000
Total ..	67,79,000

43. Against the recurring expenditure must be offset the estimated annual income of about Rs. 13 lacs. According to these figures the net expenditure per student per annum will probably be about one thousand eight hundred and twenty. The Committee is of opinion that this recurring expenditure of rupees one thousand and eight hundred and twenty is quite moderate as compared with about rupees four thousand in similar institutions abroad.

44. It should be clearly understood that the estimates are purely tentative and should be regarded as only general indications. With the growth of research activities, the recurring expenditure may be expected to increase.

N. R. SARKER (*Chairman*)

*NAZIR AHMAD.	S. LALL.	SOBHA SINGH.
S. S. BHATNAGAR.	G. L. MEHTA.	J. K. SRIVASTAVA.
D. R. DUGUID.	A. H. PANDYA.	FREDERIC TYMMS.
N. F. FROME.	M. D. PAREKH.	K. VENKATARAMAN.
J. C. GHOSH.	C. E. PRESTON.	DHARMA VIRA.
H. K. KIRPALANI.	W. G. W. REID.	W. W. WOOD.
W. W. LADDEN.	JOHN SARGENT.	R. D. T. WOOLFE.
	A. D. SHROFF.	

S. R. SEN GUPTA (*Secretary*).

*Subject to note of dissent (Please see Part II).

PART II.

NOTE OF DISSENT BY DR. NAZIR AHMAD.

While fully realising the necessity of providing suitable facilities for Higher Technical Education in India, I feel that the Committee of High Grade Technological Institutions has not proceeded on the right lines. My reasons for taking this view are as follows :—

1. At the first meeting of the Committee when general principles to be followed were considered the Committee passed the following resolution :—

> "Before deciding finally the scope and size of these institutions, it is desirable that the Committee should be in possession of all the information regarding facilities for such high technical education at present available in the country."

This resolution form a directive for the subsequent work of the Sub-Committee appointed to go into this question in greater detail, and I submit that it was completely binding upon them. Nevertheless, the Sub-Committee made very little attempt to explore the facilities which are already available in the country and which can be developed for the purpose of higher technical education. Instead, they proceeded forthwith to prepare plans for two such institutions, one to be established at Calcutta and the other at Bombay. Both these institutions are to be absolutely new and do not take into account any facilities that may already be available in these areas.

2. The Committee was definitely of the opinion that considering the size of the country, the complexities of the problems and the number of technically trained men required in the post war period, at least four large institutions are absolutely necessary. The Sub-Committee appointed to draw the plans or prepare plans only for two such institutions and have not made any recommendations regarding the scope, size, etc., of the other two institutions envisaged by the full Committee.

3. It is certain that a very large number of technically trained men will be required if all the plans for the industrial development of India for the post war period materialise. Even with the establishment of four new institutions, it would be impossible to satisfy the total requirements of the country which were stated to be several thousands technicians. Thus a big gap would be left between the actual requirements and the numbers of trained men turned out from these institutions.

4. In real planning for the future, we must take into account the existing resources and must try to build upon them. This process has always been followed in Europe and America where, whenever the need has arisen, the possibility of developing the existing institutions has first been explored before putting up new institutions. If this process is not followed, the existing institutions are likely to stagnate and decay while the newer institutions will work in an atmosphere of isolation.

5. Following the above line of argument which seems quite sound to me I feel that the right course for the Sub-Committee should have been to proceed on the following lines :—(*a*) They should have first of all determined the type and number of trained men in different subjects which would be required say in the next 5 years. This would be the target to be aimed at both in respect of quality and numbers of trained men. (*b*) They should have then written to the existing institutions such as

engineering colleges, technological institutions etc. informing them of the target which is aimed at and enquiring from them as to what additional help by way of staff, equipment, buildings etc., they require in order to produce these men in sufficient numbers. (*c*) The Committee should then have considered the claims and requirements of the existing institutions for further expansion with a view to turning out the right type of men in sufficient numbers and if satisfied that the existing institutions when properly developed and expanded can turn out these men, they should have made recommendations of grants to be given to these institutions for their expansion and development. (*d*) If on an examination of the data supplied by the existing institutions, the Committee had come to the conclusion that even after development and expansion, some of them were not able to turn out suitably trained men in specialized fields, they should have then recommended the establishment of new institutions for these specialized fields.

The process outlined above, which to my mind seems to be the right and natural process followed in other countries, would result in utilizing fully the existing institutions, in giving them an opportunity to develope and eexpand, in economising expenditure on certain basic items such as buildings, workshops etc., which are already available and in turning out a much larger number of trained men then would be possible on the basis of one or two new institutions.

The exploration of the existing institutions with a view to their further develope ment and expansion would also have the advantage that all parts of India would benefit from this scheme and expansion. If on the other hand, attention is concentrated only on the establishment of one or two new institutions, their benefits would be extremely limited leaving vast regions of the country out of the scope of their utility. In this connection consideration must be paid to the difficulty of students from very far off areas taking advantage of educational facilities at distant centres in view of large distances, high cost of education, difference in social customs etc. All these difficulties would be avoided if the existing institutions in the various provinces were developed and expanded so as to be within easy reach of the peoples of all parts of India.

Since the majority of the Members of the Committee have not found it possible to agree with my views, I am placing them before the Government for consideration before the final decision on the matter.

In case after a full decision it is decided to establish one or two High Grade Technical Institutions say in Calcutta and Bombay, I propose that quotas should be assigned to different provinces for purposes of education of students in these institutions so that the inhabitants of all the provinces may be in a position to share their benefits. These institutions would be established from all India funds and it is therefore only logical that the people of the country as a whole should have an equal share in the facilities provided in these institutions.

NAZIR AHMAD.

OFFICE OF THE INDIAN TARIFF BOARD,
BALLARD ESTATE, BOMBAY.
9th March 1946.

PART III.

Copy of Brigadier Woolfe's letter No. 5714/7/MG/CGI-IB, dated the 12th April, 1945, to Dr. John Sargent, Educational Adviser to the Government of India regarding technical Education in India.

In thinking over yesterday's Committee meeting I can't help feeling a bit unhappy at the trend of our deliberations and I think this feeling is shared by some of the other members.

2. There can be no doubt that the scientist members of the Committee steered the discussions very ably into channels with which they were very familiar with the result that emphasis was all in the direction of academic scientific training with the result that the first 2½ lines of the agenda has been very largely relegated to the background.

3. No doubt large numbers of engineers and chemists will be required for post war industries but these are the very industries which come into conflict with overseas competition already developed on much more efficient lines than India can ever hope to achieve.

On the other hand industries already developed or capable of development in India have been left out entirely or catered for only indirectly and it is to the expansion and improvement of these that the main effort should be directed.

4. The Committee decided in favour of basic training as opposed to specialist training but I notice that at least ten of the Departments at the Massachusetts Institute of Technology out of 22 deal with specialized branches of engineering. If this is necessary in the engineering field it is even more necessary in the field of chemistry physics and botany.

What I am so afraid of is that the weakness of the present system will be continued and that the market will be flooded with B.Sc.'s whom no one will employ. Give me a Fuel technologist or a Dye Chemist and I know what to do with him but difficulties arise at once when I am asked to employ a B. Sc. with chemistry or physics as his special subject.

5. Following is a list of Indian Industries, developed, partially developed, or capable of development which require specialized training and which are not catered for by the Committee's proposals :—

TEXTILES ..	*Jute.*—Probably adequately catered for by the industry except in the field of textile engineering and dyeing.
	Cotton.—There is room in every branch for men with specialized training and there is practically nothing to cater for this need.
	Wool.—Includes sheep breeding, grading, marketing, textile chemistry, textile engineering, dye chemistry, finishing, and there is nothing to cater for this.
	Silk.—Sericulture from mulberry cultivation to designing of fabrics is not catered for.
FIBRES	There is a wide undeveloped field in the case of hard fibres from aloe to hemp which is not catered for. Requires a knowledge of botany and processing.
VEGETABLE DRUGS DYES & CHEMICALS.	Ranges from strychnine to tan extract and is a field in which India is particularly rich. Requires a knowledge of botany and processing. Not catered for.

LUMBER	Ranges from Forestry, lumber mills, seasoning, carpentry and cabinet making to plywood and packaging. Woodworking of all types is poor in India it is still in the adze and bow drill stage. The Woodworking School of Bareilly has had some influence towards good work but purely local. Woodworking can of course be said to belong to the technical High School but Forestry and Utilization belongs to the Institute.
DETERGENTS AND EDIBLE OILS.	A specialized branch of chemistry very much to the fore just now owing. to the popularity of vegetable ghee. Catered for indirectly.
PHARMACY ..	The promulgation of the Pure Drugs Act will open up employment for large numbers of pharmasists. Each chemist shop must employ one and the establishment of a pharmaceutical drug industry will call for many more in addition to Chemical engineers. Not catered for.
COAL TAR ..	Distillation of coal and wood covers a very wide range calling for specialized training. Catered for only indirectly.
FUEL	With the development of the oil industry fuel technologists and lubrication engineers will be required. Not catered for.
TANNING ..	Leacher Chemistry is a specialized subject which has been catered for only indirectly.
CEREMICS & GLASS	Not catered) for.
MINING ENGINEERING.	It is understood that the Geological Survey is to be strengthened considerably will result in greater mining activities. Oil of course is a branch of this.

There are no doubt other industries which I cannot think of at the moment but enough has been said to illustrate my point, *i.e.*, that the Committee's proposals do not to my mind " ensure an adequate supply of technical personnel for post war industrial development ".

6. One further point is the question of numbers. Sir J. C. Ghosh mentioned the figure of 4,000 per year. I have forgotten his formula which I think was based on the cost of the Bombay Plan.

The Committee's proposals visualize 2,000 per year after 7 or 8 years, *i.e.*, 3 years planning & building and 4 years course. A number of these will be absorbed in the teaching profession and in research. The regional Institutes will follow later at an unspecified date. Is this sufficient to meet industries' requirement ? I doubt it and think more could be done.

For instance a Textile Institute on the Lines of the Manchester Institute of Technology could be started at the same time as the Central one without interfering or competing with it in any way and its courses could be filled with graduates and nominations from the industry. I have a feeling that this industry will not be prepared to wait 8 years for trained technicians but will take the initiative themselves specially when they find they can get only chemists, physists and engineers from the Central Institute with no specialized training.

PART IV.

Memorandum prepared by the Secretary on the Establishment of the Eastern Higher Technical Institution for about 3,000 students.

Introduction.

1. As recommended by the sub-committee, a plan has been drawn up to provide facilities for instruction of about 2,000 under-graduate and 1,000 post-graduate students. In the under-graduate stage, instruction upto Honours standards will be provided. The length of the courses will be of four years' duration. A minimum number of 380 graduates (the number in different branches is shown below*), is expected from this College every year. The estimated sizes of different classes in under-graduate departments are shown in Appendix II. Although it is difficult to forecast the annual output from the post-graduate department, nevertheless it would be safe to anticipate an annual out-put of 100 highly qualified research workers in the different branches.†

2. In order to arrive at an estimate of minimum recurring and capital expenditure, it was found necessary to map out the rough outline of courses of under-graduate study. Although no claim to perfection in this design is made, it is hoped that the general make up will not be found to be very defective, since the outline has been drawn up following certain accepted general principles (embodied in Appendix I). The list of subjects and the relative importance attached to each will be found in Appendix III. The corresponding under-graduate teaching load calculations and the minimum staff requirements are shown in Appendix IV.

3. The possible composition of the post-graduate student body and the minimum additional staff required are shown in Appendix V.

4. The Appendix VI shows the minimum required strength of the teaching and administrative staff.

5. The possible minimum recurring expenditure on staff salaries is estimated to be Rs. 26,68,200 as shown in Appendix VII and that on laboratory, workshops, scholarships etc. to Rs. 23,01,000 as shown in Appendix VIII. The gross recurring expenditure including 5% interest charge on capital outlay works out to Rs. 67,79,000 only as shown below :—

	Rs.
Salaries, Provident Fund	29,35,000
Other Charges	23,01,000
Interest etc.	15,43,000
Total ..	67,79,000

*Aeronautical Engineering (40); Civil and Sanitary Engineering (40); Chemical Engineering (60); Electrical Engineering (60); Mechanical Engineering (60); Building Construction (60); Metallurgy (20); Geology and Geophysics (20); Botany (10); and Meteorology (10).

†Fuel Technology; Pharmaceuticals and Fine Chemicals; Regional Planning; Paper Technology; Glass and Ceramics; Plastics; Paints and Pigments; Hydraulic and River Research; Transportation; Structural Engineering; Design of Electrical Machinery; Radio Engineering; Refrigeration and Air Conditioning; Automobile Engineering; Machine Tools; Design of Machinery and Instruments; Light Alloys; Industrial Physics; Electronics; Economic Botany; Geology and Geophysics; Mineralogy; Meteorology.

Against this must be offset the estimated annual income of Rs. 13,16,000 shown in Appendix X.

6. The nett expenditure per student per annum will probably be about Rs. 1,820 which is very modest as compared to about Rs. 4,000 in similar institutions abroad.

7. The minimum requirements of accommodation in the College building are shown in Appendix XII (and summarised in Appendix XIII), and those of residential accommodation for students and staff in Appendix XIV. The probable initial capital expenditure on apparatus, machine tools, furniture, library etc. are shown in Appendix XV. The total capital expenditure comes to about Rs. 3,09,43,500 as summarised below :—

	Rs.
(1) Land Acquisition	8,00,000
(2) Water Supply, Sewage Plant, Roads, etc.	15,00,000
(3) College Building	55,13,500
(4) Equipment	1,02,30,000
(5) Furniture	9,40,000
(6) Students Hostel	66,30,000
(7) Staff quarters	53,30,000
Total ..	3,09,43,500

8. It should be clearly understood that the plan is only a tentative one, and that the estimated capital and recurring expenditure are only indications of the expenditure likely to be required in the near future. With the growth of research activities, the recurring expenditure will certainly increase.

APPENDIX I.

General Considerations.

I. General Principles in the Design of Under-Graduate Course of Study.

1. The general nature and method of work of engineers have undergone considerable changes during recent years. No institution for higher engineering and technical education can be regarded as fulfilling its functions adequately unless it produces young men and women resonably well equipped to meet the altered requirements.

2. The course of study in an institution should hence be designed to provide a combination of a fundamental scientific training with a broad human outlook, which will afford the students the type of collegiate education endorsed by leading engineers—one which avoids on the one hand the narrowness common among students in technical colleges and, on the other, the superficiality and lack of purpose noticeable in many of those taking academic college courses.

3. The guiding principles should be :—

(*i*) to assist in the development of character, outlook and mental ability in a student so that he may become a useful citizen ;

(*ii*) to teach him the fundamental principles and theories of engineering so that an individual student can apply these with confidence many years later ;

(*iii*) to equip him with tools and inspire in him the desire to continue, after the end of the student's formal training, the independent study of practical processes, technical principles, administrative organisation and advanced theory;

(*iv*) to give him, during formal training, such knowledge of practical work as would assist the student in realistic appreciation of engineering principles as applied in practice;

(*v*) to teach him sound general methods of experimentation and thus enable him to arrive at prompt and reliable conclusions; and

(*vii*) to develop his ability to write clear and concise technical reports and the ability to participate in verbal discussion on technical matters.

4. Certain points of rather important detail should not be passed over without mention.

(*a*) In addition to sound training in basic sciences, general engineering and in the humanities, a student should be given a thorough grounding in the fundamentals of his chosen branch of engineering and he should be free to elect a special subject for more intensive study.

(*b*) The project and design work in the final year should take the form of a thesis so that the student will have opportunities for exercising initiative and thought and will not merely rely on his ability to do calculations of set design problems.

(*c*) Even during his academic studies, the student should be brought face to face with problems of engineering practice and should be taught to realize the full implications of his theoretical studies in relation to practical problems.

11. Workshop and Practical Training.

1. Although an engineer is not a craftsman nor is expected to possess the same degree of manual skill as an artisan, yet he must have an intimate knowledge of workshop processes and methods. And since the bulk of the student body will be drawn from a population with an essentially rural and agricultural background, the question of a student's workshop and practical training assumes an importance of greater significance here than in the West.

2. It is necessary to provide in the College facilities for instruction in elementary workshop processes and methods either prior to academic instruction or during the college course. A post-school and pre-college workshop training is considered by some authorities to be the proper place for it in a training programme, while others regard this as objectionable educationally on the ground of the resultant long gap between the lower and higher stages of education. A compromise has been practised in most Indian colleges by providing basic workshop training as an integral part of the College course. Although this is not entirely free from objections either, adoption of this system appears to be the best solution under the present conditions.

3. In addition to this, adoption of the following training programme is recommended :—

(*a*) A student should take continuous workshop training in the College for one term each year during the first two years of his college course. Students who have had previous workshop training should spend this period on outside works.

(*b*) At the end of the third year, all students should spend one term on outside works under the guidance of college teachers.

(*c*) Graduates in all branches must spend one year after their final examination on practical training. This training should conform to a pre-arranged plan and every graduate-trainee should submit monthly reports to a special officer of the College whose duty it will be to ensure that the training period is being properly utilized.

(*d*) Field trips, lectures by eminent specialists should, of course, form part of the regular instruction, and be not regarded as an extra-curricular activity.

III. Efficient Instruction, Teaching Staff, Size of classes.

1. No matter how good the course of study and the training programme, the quality of the product of a college will depend on the quality of instructions; and this depends in the first degree on the quality of the teaching staff. There is an essential difference between the teacher of a technical subject and a teacher of purely academic subjects. The former is and must continue to be a technical man.

2. By allowing the teachers to undertake a limited amount of consulting practice and by encouraging them to conduct research and to go back to industry periodically, it should be possible to keep them as live-wires; this will indubitably improve the standard of instruction. Exchange of technical men between colleges and industry, if possible, would also prove to be of mutual benefit.

3. In order to attract the best men to teaching posts, the salaries and prospects of technical men who devote themselves to teaching should be commensurate with those open to them if they followed an industrial career.

4. The teaching load on a teacher should not be so heavy as to leave him no time for study and research.

5. Personal contact between the teacher and the taught is necessary to achieve the best results. The size of lecture classes should thus be limited to 30 students, and that of laboratory, drawing and tutorial and guided study classes to 10 students per teacher.

VI. Admission Requirements, Selection, Scholarships.

1. Facilities for up-to-date and efficient instruction will not, however, produce the best results unless means are devised to ensure that they are made available to the right type of persons. The efficient engineer is one who is alert in mind and thoroughgoing in application. Therefore, only those applicants whose evidence of academic fitness and professional promise indicate that they are likely to pursue the college course with profit should be admitted to this college.

2. An Entrance Board should conduct written examination to test the applicants' academic fitness and psychological tests and *viva-voce* examination to gauge his professional promise. The subjects of written examination should be English Composition, Mathematics, Science, Drawing and Sketching.

3. In general, admission should be made in order of merit. But some proportion of the seats should be reserved for educationally backward people so that, in due course the general level of education throughout the country may be raised.

4. To enable and encourage poor but meritorious students to pursue the college course, a sufficient number of scholarships (400 provided for in the estimate) should be provided.

APPENDIX II.

Possible size of Classes (under-graduate).

Class Year.	1	2	3	4	Total.	Annual Out-Turn of Graduates.
SUBJECT.						
Aeronautical Engineering ..	60	50	45	42	197	40
Civil and Sanitary Engineering ..	,,	,,	,,	,,	197	40
Chemical Engineering	90	80	70	65	305	60
Electrical Engineering	,,	,,	,,	,,	305	60
Mechanical Engineering ..	,,	,,	,,	,,	305	60
Building Construction	,,	,,	,,	,,	305	60
Metallurgy	30	26	23	21	100	20
Geology, Geophysics	,,	,,	,,	,,	100	20
Botany*	15	13	12	11	51	10
Meteorology†	,,	,,	,,	,,	51	10
TOTAL ..	570	498	440	408	1,916	380
Excess provision ..			84			
TOTAL ..			2,000			

APPENDIX II (a)

Number of Under-graduate Sections.

Class Year.	1	2	3	4
SUBJECT.				
Aeronautical Engineering	2	2	2	2
Civil and Sanitary Engineering	2	2	2	2
Chemical Engineering	3	3	3	3
Electrical Engineering	3	3	3	3
Mechanical Engineering	3	3	3	3
Building Construction	3	3	3	3
Metallurgy	1	1	1	1
Geology and Geophysics	1	1	1	1
Botany	1	1	1	1
Meteorology	1	1	1	1
TOTAL	20	20	20	20

*It would be possible to take a few more students in these departments.
†With careful selection, the wastage will be considerably reduced.

APPENDIX III

Curricula and Hours devoted to each subject.

1. Against each subject listed below :

(L) stands for lecture hours per week,

(GST) stands for Guided Study and Tutorial,

(LDFW) stands for Laboratory, Drawing, Field Work, Workshop hours per week, and (Prep) stands for Home preparation hours per week.

2. The academic session will consist of terms of 12 weeks, six weeks and 12 weeks each, commencing from July and ending in March.

3. The fourth term April and May to be spent on practical training : eight weeks.

4. Course designed on the basis of 30 hours of instruction per week (exclusive of workshops practice), during the term.

5. The courses have been so designed that students may change the branch of study at the end of the second year if they should choose to do so.

APPENDIX III (a)

First Year Course (Common to all Branches of Engineering).

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Mathematics (I)	4	4	..	8	4
Physics	2	1	2	5	2
Chemistry	2	1	2	5	2
Drawing (I)	1	..	5	6	2
English	2	2	..	4	2
Career Lectures and Current events, Civics	2	..	..	2	2
Total	13	8	9	30	12
Workshop (one full and one half day)				9	
Physical Instruction and Games				3	

Six weeks on Carpentry,
Six weeks on Blacksmithy,
Six weeks on Fitting,
Six weeks on Tinsmithy,
Six weeks on Masonry.

(The Fourth term to be spent on Workshop training in the college or practical training outside).

APPENDIX III (b)

Second Year Course (Common to all Branches of Engineering).

Subject	(L)	(GST)	(LDF)	(TL)	(Prep)
Surveying	1	..	1½	2½	1
Details of Construction and Estimating ..	1	..	1½	2½	3
Drawing & Graphics	..	..	5	5	1
Elements of Heat Engines (I)	2	1	2	5	2
Elements of Electrical Technology (I) ..	2	1	2	5	2
Applied Mechanics (I)	2	1	2	5	2
Mathematics	2	1	..	3	2
Sociology, Industrial Relation and Industrial Hygiene	2	..	..	2	2
Total ..	12	4	14	30	15
Workshop (one full and one half day) ..	..	..		9	
Physical Instruction and Games—3 hours	..	..		3	

(Students in Civil Engineering and Building Construction will devote the fourth term to Field Survey in camps and others to workshop practice in the college.)

APPENDIX III (c)

Third Year Civil Engineering Course.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep)
Applied Mechanics (II)	3	2	3	8	5
Structures and Design (I)	2	2	3	7	4
Geodesy	1	..	2	3	1
Roads and Pavements	1	..	..	1	1
General Civil Engineering and Estimating	2	..	2	4	2
Engineering Geology	2	..	2	4	2
Economics and Accounts ..	3	..	..	3	2
Total ..	14	4	12	30	17
Workshop (one full day)				6	

(The fourth term will be spent on outside work pertaining to his own elective.)

APPENDIX III (d)

Fourth Year Civil Engineering Course.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep)
Hydraulics	2	..	3	5	2
Reinforced Concrete, Foundation and Structures	4	..	5	9	5
Project Preparations, Analysis and Organisation	2	..	..	2	2
Planning and Layout	2	..	2	3	4
Elective	2	..	3	5	3
Project and Thesis	1	..	7	8	7
Total ..	13	..	20	32	23

Electives :

Railways.
Sanitary Engineering.
Irrigation and Flood Control.
Water Power Engineering.
Earthquake Proof Structures.
Advanced Structures.
Mobile Field Equipment.
High Way Engineering.

APPENDIX III (e)

Third Year Mechanical Engineering Course.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Applied Mechanics II	3	1	3	7	3
Machine Design	1	..	6	7	3
Heat Engines	3	1	1½	5½	3
Electrical Technology	2	1	1½	4½	3
Meteorology and Workshop Methods ..	2	..	1	3	1
Economics and Accounts	3	..	..	3	2
Total ..	14	3	13	30	15
Workshops (one full day)				6	

(The fourth term to be spent on outside work pertaining to his own elective.)

APPENDIX III (f)

Fourth Year Mechanical Engineering Course.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep)
Hydraulic Machinery	2	..	3	7	2
Theory of Machines	2	..			2
Heat Engines	3	..	3	6	3
Workshop Theory	2	..	..	2	2
Planning, Layout, Production	2	..	3	5	4
Elective	2	..	3	5	3
Project and Thesis	1	..	7	8	6
Total ..	14	..	19	33	22

Electives :

Production Engineering.
Machine Tools.
Automobile Engineering.
Refrigeration and Air-Conditioning.
Mobile Equipment.
Industrial Plants.
Steam Turbines.
Metallurgy.
Design Problems.

APPENDIX III (g).

Third Year Building Construction Course.

SUBJECT	(L)	(GST)	(LDF)	(TI)	(Prep)
Architectural Principles	2	1	5	8	4
Roads and Pavement	1	..	..	1	1
Building Construction	4	2	5	11	4
Sanitation	1	1	..	2	1
Heating and Ventilation	1	..	..	1	1
Engineering Geology	2	..	2	4	2
Economics and Accounts	3	..	..	3	2
TOTAL ..	14	4	12	30	15

Workshops (one full day) 6

(The fourth term to be spent on outside work pertaining to his own elective.)

APPENDIX III (h).

Fourth Year Building Construction Course.

SUBJECT	(L)	(GST)	(LDF)	(TL)	(Prep)
Architectural Design	1	..	10	11	6
Accoustics Illumination	2	..	..	2	2
Principle of city Planning	2	..	3	5	2
Project Preparation, Analysis Organisation	2	..	..	2	2
Elective	2	..	3	5	3
Project and Thesis	1	..	7	8	7
TOTAL ..	10	..	23	33	22

Electives :

History of Architecture.
Reinforced Concrete Structures.
Steel Structures.
City and Regional Planning.
Valuation.

APPENDIX III (i).

Third Year Metallurgical Engineering Course.

SUBJECT	(L)	(GST)	(LDF)	(TL)	(Prep)
Refractories, Furnaces and Dressing of Minerals	2	..	1	3	2
General Metallurgy	3	1	..	4	2
Fuels	1	1	2	4	2
Physical Chemistry	2	..	1½	3½	2
Advanced Chemistry	2	..	3	5	2
Geology	2	..	2	4	2
Electrical Technology	1	1	1½	3½	2
Economics and Accounts	3	..	..	3	2
TOTAL ..	16	3	11	30	16

Workshops (one full day) 6

(The fourth term to be spent on outside work pertaining to his own elective.)

APPENDIX III (j).

Fourth Year Metallurgical Engineering Course.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep)
Metallurgy of Iron and Steel	3	..	..	3	3
Non-Ferrous Metallurgy	2	..	..	2	2
Assaying	1	..	2	3	2
Electro-Metallurgy	1	..	..	1	1
Metallography, Heat Treatment and Pyrometry	3	..	5	8	3
Mechanical Testing and Working of Metals	1	..	2	3	1
Furnace Design	..	..	5	5	4
Elective	2	..	2	4	2
Thesis	1	..	3	4	4
Total	14	..	19	33	22

Electives :

Metallurgy of Alloy steels.
Advanced Metallurgy of Non-Ferrous Alloys.
Surface Treatment.
X-Ray Metallography.
Physics of Metals.
Powder Metallurgy.

APPENDIX III (k)

Third Year Electrical Engineering Course.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep)
Applied Mechanics	3	1	3	7	3
Workshop Methods and Metrology	2	..	1	3	1
Heat Engines	2	1	1½	4½	3
Mathematics	2	..	..	2	1
Electrical Technology	4	2	4½	10½	5
Economics and Accounts	3	..	..	3	2
Total	16	4	10	30	15

(The foruth term to be spent on outside work pertaining to his own elec tive).

APPENDIX III (l).

Fourth Year Electrical Engineering Course.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep)
Generation	2	..	1½	3½	3
Transmission and Distribution	4	..	1½	5½	3
Electrical Machine Design	2	..	4	6	3
Power System Planning and Layout	2	..	3	5	4
Elective	2	..	3	5	3
Project and Thesis	1	..	7	8	6
Total	13	..	20	33	22

Electives :—

Electrical Communication.
Electric Traction.
Illumination Engineering.
Electronics.
Plastics.
Refrigeration and Air Conditioning.
Production Engineering.
Instruments.
Design Problems.

APPENDIX III (m).

Third Year Course in Aeronautical Engineering.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Applied Mechanics	3	1	2	6	5
Heat Engines	2	1	1½	4½	2
Electrical Engineering	2	1	1½	4½	2
Machine Drawing	1	..	3	4	..
Aerodynamics and Aeroplane Structures	4	1	3	8	4
Economics and Accounts	3	..	..	3	2
Total	15	4	11	30	15
Workshop (one full day)				6	

(The fourth term to be spent on outside work).

APPENDIX III (n).

Fourth Year Course in Aeronautical Engineering.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Aero Engines Aeroplane Performance, and Aeroplane Stability and Control	6	..	4	10	8
Aeroplane Design Practice Aeroplane Structures	2	..	8	10	6
Elective	2	..	3	5	3
Thesis	1	..	7	8	5
Total	11	..	22	33	22

Electives :

Meteorology.
Advanced Aerodynamics.
Advanced Structure.
Production Methods.
Automotive Engines.
Metallurgy.
Plastics.

APPENDIX III (o).

Third Year Course in Chemical Engineering.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Inorganic, Organic and Physical Chemistry	5	2	11	18	10
Physical Metallurgy	1	1	..	2	1
Fuels and Combustion	1	..	1	2	1
Engineering Drawing and Design ..	1	..	4	5	1
Economics and Accounts	3	..	..	3	2
Total ..	11	3	16	30	15
Workshop (one full day)				6	

(The fourth term to be spent on the outside work).

APPENDIX III (p).

Fourth Year Course in Chemical Engineering.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Unit operations of Chemical Engineering	4	..	8	12	6
Chemical Plant Design and Thesis ..	1	..	9	10	6
Heat Transmission	1	..	1	2	1
Transport and Storage of materials ..	1	..	..	1	1
Power Generation and Distribution ..	1	..	..	1	1
Factory Layout and Construction Organisation and Management	2	..	..	2	2
Elective	2	..	3	5	5
Total ..	12	..	21	33	22

Electives :

Heavy Chemicals.
Light Chemicals.
Pharmaceutics.
Plastics.
Fuel Technology.
Ceramics.
Metallurgy.

APPENDIX III (q).

First Year Course (Common to Geology, Botany, Meteorology.)

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Mathematics	4	2	2	8	4
Chemistry	3	1½	3	7½	3
Physics	3	1½	3	7½	3
English	2	2	..	4	2
Drawing and Sketching	1	..	..	1	1
Career Lectures, Current Events, Civics ..	2	..	..	2	3
Total ..	15	7	8	30	16
Physical Instruction and Games ..				3	

APPENDIX III (r).

Second Year Course in Geology and Geophysics.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Geology and Mineralogy	4	2	6	12	6
Zoology	2	1	3	6	2
Botany	2	1	3	6	2
Physical Chemistry	1	..	1	2	1
Palæontology	1	..	1	2	1
Language	2	..	..	2	3
Total ..	12	4	14	30	15
Physical Instruction and Games ..	..	..	..	3	—

(The fourth term to be spent on field work.)

APPENDIX III (s).

Third Year Course in Geology and Geophysics.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Geology and Mineralogy	7	3	9	19	7
Palæontology	1	..	1	2	1
Language	3	..	..	3	3
Physics	3	..	..	3	2
Mathematics	3	..	..	3	2
Total ..	17	3	10	30	15

(The fourth term to be spent on field work.)

APPENDIX III (t).

Fourth Year Course in Geology and Geophysics.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Geology, etc.	7	..	8	15	7
Elective	5	..	5	10	7
Thesis	1	..	7	8	8
Total ..	13	..	20	33	22

Electives :

Economics.
Geology.
Structural Geology of Petroleum.
Palæontology.
Geophysics.
Petrology.

APPENDIX III (u).

Second Year Course in Botany.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Botany	4	2	6	12	6
Zoology	2	1	3	6	2
Geology	2	1	2	5	2
Biochemistry	1	..	2	3	1
Palæontology	1	..	1	2	1
Language	2	..	..	2	3
Total ..	12	4	14	30	15
Physical Instruction and Games ..	..	..	..	3	..

(The fourth term to be spent on Field work.)

APPENDIX III (v).

Third Year Course in Botany.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Botany	6	3	12	21	8
Ecology	2	..	..	2	1
Algæ	2	..	..	2	1
Genetics	1	..	..	1	1
Taxonomy	1	..	..	1	1
Language	3	..	..	3	3
Total ..	15	3	12	30	15

(The fourth term to be spent on field work.)

APPENDIX III (w).

Fourth Year Course in Botany.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Botany	7	..	8	15	7
Elective	5	..	5	10	7
Thesis	1	..	7	8	8
Total ..	13	..	20	33	22

Electives.:

Physiology of Plants.
Morphology & Physiology of Fungi.
Physiology of Parasitism.
Soil Bacteriology.
General Bacteriology.

APPENDIX III (x).

Second Year Course in Meteorology.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Applied Mechanics	2	..	2	5	2
Machine tools Laboratory	..	1	4	4	1
Physics	3	2	3	8	4
Mathematics	5	3	..	8	5
Drawing	2	..	..	2	..
Language	3	..	..	3	3
Total ..	15	6	9	30	15
Physical Instruction and Games ..	..	..	..	3	..

(The Fourth term to be spent on field work.)

APPENDIX III (y).

Third Year Course in Meteorology.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Mathematics	3	2	..	5	3
Physics	3	..	3	6	2
Language	3	..	..	3	3
Meteorology	7	2	7	16	7
Total ..	16	4	10	30	15

(The fourth term to be spent on field work.)

APPENDIX III (z).

Fourth Year Course in Meteorology.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
Meteorology	7	..	8	15	7
Elective	5	..	5	10	7
Thesis	1	..	7	8	6
Total ..	13	..	20	33	20

APPENDIX IV.

1. For the purposes of calculation of teaching load on each department it has been assumed that the number of students in Lecture classes will not exceed 30 each and that for guided study, tutorial, laboratory and drawing classes a teacher will be required for every 10 students.

2. Here again (L) stands for Lecture classes, (GST), (LDF) stand for guided study, tutorial and laboratory classes.

3. For the purposes of fixing the number of teaching staff, the following distribution of work has been assumed :—

Senior Professor or Head of Department ..	L	7	hours/week.
Professor	L	8	do.
	GST	4	do.
Asstt. Professor	L	8	do.
	GST	6	do.
Lecturer	L	12	do.
	GST	3	do.
Instructor	GST	20	do.

This will leave the staff some time for study and research and for occasional post-graduate teaching.

APPENDIX IV (A).

Teaching Load on the Department of Mathematics.

CLASS	(L)	(GST)	(LDF)	(SECTIONS)
1st year Engineering	4	4	..	17
2nd year Engineering	2	1	..	17
3rd year Electrical Engineering	2	..	..	3
1st year Science	4	4	..	3
3rd year Geology	3	..	..	1
2nd year Meteorology	5	3	..	1
3rd year Meteorology	3	2	..	1

Lectures Load=$(4\times17) + (2\times17) + (2\times3) + (4\times3) + (3\times1) + (5\times1) + (3\times1)$= 131 hours/week.

G.S.T. Load = $3(4\times17) + (1\times17) + (4\times3) + (3\times1) + (2\times1) = 3(102) = 306$ hours/week.

STAFF REQUIRED

One Professor of Applied Mathematics	L(7)
One Professor of Statistics	L(8), GST(6)
One Asstt. Professor of Pure Mathematics ..	L(8), GST(6)
Nine Lecturers	L(12) GST(3) each
Fourteen Assistants	GST(20) each

APPENDIX IV (B).

2. Teching Load on the Department of Physics

CLASS	(L)	(GST, LDF)	(SECTIONS)
1st year Engineering	2	3	17
1st year Science	3	4½	3
2nd year Meteorology	3	5	1
3rd year Meteorology	3	3	1
3rd year Geophysics	3	..	1
4th year Building Construction	2	..	3

Lecture Load = $(2\times17) + (3\times3) + (3\times1) + (3\times1) + (3\times1) + (2\times3)$ = 58 hours/week.

G.S.T. and LDF Load = $3((3\times17) + (4\frac{1}{2}\times3) + (5\times1) + (3\times1)) = 3\times73$ = $(2+3)$=219 hours/week.

STAFF REQUIRED

One Professor :—	L(7)
One Asstt. Professor :—	L(8) GST (6)
Four Lecturers :—	L(11) GST (5) sach
Ten Assistants :—	GST (20) each

APPENDIX IV (C).

Teaching Load on the Department of Chemistry.

CLASS	(L)	(GST, LDF)	(SECTIONS)
1st year Engineering	2	3	17
3rd year Metallurgy	4	5	1
2nd year Botany	1	2	1
3rd year Chemical Engineering	5	13	3
1st year Science	3	4½	3
2nd year Geology	1	1	1

Lecture Load $=(2\times17)+(4\times1)+(1\times1)+(5\times3)+(3\times3)+(1\times1)=$ 64 hours/week.

GST and LDF Load $= 3(\ (3\times17)+(5\times1)+(2\times1)+(13\times3)+(4\frac{1}{2}\times3)+(1\times1) =$ $=3\times112=336$ hours/week.

STAFF REQUIRED

One Professor	L(7)	
One Asstt. Professor	L(8)	GST (6)
Four Lecturers	L(12)	GST (4) each
Sixteen Assistants		GST (20) each

APPENDIX IV (D)

Teaching Load on the Department of Humanities.

ENGLISH AND LANGUAGE

CLASS	(L)	(GST)	(SECTIONS)
1st year Engineering and Science	2	2	20
2nd year Science	2	..	3
3rd year Science	8	..	3

Lecture Load $=(2\times20)+(2\times3)+(3\times3) = 55$ hours/week.

GST Load $=3\times2\times20=$ 120 hours/week.

STAFF REQUIRED

Four Lecturers in English	L(10)	GST (6)
One Lecturer in German	L(6)	GST (10)
One Lecturer in French	L(9)	GST (7)
Four Assistants in English		GST (17)

APPENDIX IV (D i)

Economics, Accounts, Civics, Sociology.

CLASS	(L)	(GST)	(SECTIONS)
1st year Engineering and Science	2	..	20
2nd year Engineering	2	..	17
3rd year Engineering	3	..	17

Lecture Load $=(2\times20)+(2\times17)+(3\times17)=125.$

STAFF REQUIRED

One Professor	L (7)
One Asstt. Professor	L (13)
Six Lecturers	L (17)

APPENDIX IV (E)

Teaching Load on the Department of Drawing.

Class	(L)	(GST, LDF)	(SECTIONS)
1st year Engineering	1	5	17
2nd year Engineering	..	5	17
1st year Science	1	..	3
2nd year Meteorology	2	..	1

Lecture Load = $(1\times17)+(1\times3)+(2\times1)$ = 22 hours/week.

LDF Load = $3[\ (5\times17)+(5\times17)\ ]$ = 510 hours/week.

STAFF REQUIRED

One Asstt. Professor	L(10)	GST (4)
One Lecturer	L(12)	GST (4)
Twenty Five Assistants		GST(20)

APPENDIX IV (F)

7. Teaching Load on the Department of Applied Mechanics.

Class	(L)	(GST, LDF)	(SECTIONS)
2nd year Engineering	2	3	17
3rd year Civil Engineering	3	5	2
4th year Civil Engineering	2	3	2
3rd year Mechanical Engineering	3	4	3
4th year Mech. Engineering	4	3	3
3rd year Electrical Engineering	3	4	3
3rd year Aeronautical Engineering	3	3	2
2nd year Meteorology	2	4	1

Lecture Load = $(2\times17)+(3\times2)+(2\times2)+(3\times3)+(4\times3)+(3\times3)+(3\times2)+(2\times1)$ = 82 hours/week.

GST, LDF Load = $3\ [\ (3\times17)+(5\times2)+(3\times2)+(4\times3)+(3\times3)+(4\times3)+(3\times2)+(4\times1)\ ]$

$= 3\times110 = 330$ hours/week.

STAFF REQUIRED

One Professor	L (6)	GST (2)
One Asstt. Professor	L (7)	GST (6)
Six Lecturers	L (12)	GST (4) each
Fifteen Assistants		GST (20) each

APPENDIX IV (G)

Teaching Load on the Deptt. of Civil Engineering.

Class	(L)	(GST, LDF)	(SECTIONS)
2nd year Engineering	2	3	17
3rd year Civil Engineering	6	9	2
4th year Civil Engineering	9	14	2
4th year 6 Electives	12	18	..
3rd year Building Construction	2	..	3

Lecture Load = $(2\times17)+(6\times2)+(9\times2)+(12)+(2\times3)$ = 82 hours/week.

GST, LDF Load = $3\ (3\times17)+(9\times2)+(14\times2)+(18)\ )=3\ (115)=345$ hours/week.

STAFF REQUIRED

One Professor	L (7)	
One Professor	L (8)	GST (4)
Four Asst. Professors	L (8)	GST (6) each
Three Lecturers	L (12)	GST (4) each
Fifteen Assistants		GST (20) each

APPENDIX IV (H)

Teaching Load on the Deptt. of Mechanical Engineering

CLASS	(L)	(GST, LDF)	(SECTIONS)
2nd year Engineering	2	3	17
3rd year Mech. Engg.	6	9	3
4th year Mech. Engg.	8	13	3
4th year 6 Electives	12	18	..
3rd year Electrical Engg.	4	4	3
3rd year Aeronautics	3	4	2
2nd year Meteorology	..	4	1
3rd year Chemical Engg.	1	4	3

Lecture Load $=(2\times17)+(6\times3)+(8\times3)+(12)+(4\times3)+(3\times2)+(1\times3)=$ 109 hours/week.

GST, LDF Load $= 3[(3\times17)+(9\times3)+(13\times3)+(18)+(4\times3)+(4\times2)+(4\times1)+(4\times3))]$
$=3+171=513$ hours/week.

STAFF REQUIRED

One Professor	L (7)	
One Professor	L (8)	GST (4)
Six Asstt. Professors	L (8)	GST (6) each
Three Lecturers	L (12)	GST (4) each
Twenty Three Assistants		GST (20) each

APPENDIX IV (I)

Teaching Load on the Deptt. of Electrical Engineering.

CLASS	(L)	(GST, LDF)	(SECTIONS)
2nd year Engineering	2	3	17
3rd year Mech. Engineering	2	3	3
3rd year Metallurgy	1	2	1
3rd year Electrical Engineering	4	6	3
4th year Electrical Engineering	11	17	3
4th year 6 Electives	12	18	..
3rd year Aeronautics	2	3	2

Lecture Load $=(2\times17)+(2\times3)+(1\times1)+(4\times3)+(11\times3)+(12)+(2\times2)=102$ hours/week.

GST, LDF-Load $=3\ [(3\times17)+(3\times3)+(2\times1)+(6\times\ )+(17\times3)+(18)+(3\times2)]$
$=3\times155=465$ hours/week.

STAFF REQUIRED

One Professor	L (7)		
One Professor	L (8)	GST (4)	
Six Asstt. Professors	L (8)	GST (6)	each
Three Lecturers	L (13)	GST (3)	each
Twenty One Assistants		GST (20)	each

APPENDIX IV (J)

Teaching Load on the Deptt. of Building Construction.

Class	(L)	(GST, LDF)	(Sections)
3rd yr. Building Construction	7	13	3
4th yr. Building Construction	6	20	3
4th yr. 6 Electives	12	18	..

Lecture Load $=(7\times3)+(6\times3)+12=51$ hours/week.

GST, LDF-Load $=3\,[\,(13\times3)+(20\times3)+(18)\,]=3\times117=351$ hours/week.

STAFF REQUIRED

One Professor	L (7)
One Professor	L (8) GST (4)
Four Asstt. Professors	L (9) GST (5) each
Seventeen Assistants	GST (20) each

APPENDIX IV (K)

Teaching Load on the Deptt. of Metallurgical Engineering.

Class	(L)	(GST, LDF)	(Sections)
3rd yr. Metallurgy	6	5	1
4th yr. Metallurgy	12	17	1
4th yr. 6 Electives	12	12	..
3rd yr. Chemical Engineering	2	2	3

Lecture Load $=(6\times1)+(12\times1)+(12)+(2\times3)=36$ hours/week.

GST, LDF-Load $=3\,[\,(5\times1)+(17\times1)+(12)+(2\times3)\,]=3\times40=120$ hours/week.

STAFF REQUIRED

One Professor	L (7)
Four Asstt. Professors	L (8) GST (6) each
Five Assistants	GST (20) each

APPENDIX IV (L)

Teaching Load on the Deptt. of Aeronautical Engineering.

Class	(L)	(GST, LDF)	(Sections)
3rd yr. Aeronautics	4	4	2
4th yr. Aeronautics	9	19	2
4th yr. 4 Electives	8	12	..

Lecture Load $=4(\times2)+(9\times2)+(8)=34$ hours/week.

GST, LDF-Load $=3\ (4\times2)+(19\times2)+(12)=3\times58=174$ hours/week.

STAFF REQUIRED

One Professor	L (7)
Three Asstt. Professors	L (8) GST (6) each
One Lecturer	L (3) GST (13)
Seven Assistants	GST (20)

APPENDIX IV (M)

Teaching Load on the Deptt. of Chemical Engineering.

Class	(L)	(GST, LDF)	(Sections)
4th yr. Chemical Engineering	10	18	3
4th yr. 6 Electives	12	18	..

Lecture Load, $=(10\times3)+(12)=42$ hours/week.

GST, LDF-Load $=3\,(18\times3)+18=3\times12=216$ hours/week.

STAFF REQUIRED

One Professor	L (7)
One Professor	L (8) GST (6)
Four Asstt. Professors	L (7) GST (7) each
Nine Assistants	GST (20) each

APPENDIX IV (N).

Teaching Load on the Deptt. of Geology and Geophysics.

Subject	(L)	(GST)	(LDF)	(TL)	(Prep.)
3rd yr. Civil Engg.		2	2		2
3rd yr. Building Construction		2	2		3
3rd yr. Metallurgy		2	2		1
2nd yr. Botany		2	3		1
2nd yr. Geology		5	9		1
3rd yr. Geology		8	13		1
4th yr. Geology		8	15		1
4th yr. 6 Electives		30	30		..

Lecture Load $=(2\times2)+(2\times3)+(2\times1)+(2\times1)+(5\times1)+(8\times1)+(8\times1)+30$
$=65$ hours/week.

GST, LDF-Load $=3\,(2\times2)+(2\times3)+(2\times1)+(3\times1)+(9\times1)+(13\times1)+(15\times1)+30=3\times82=246$ hours/week.

STAFF REQUIRED

One Professor	L (7)
Three Asstt. Professors	L (8) GST (6) each
Three Lecturers	L (11) GST (5) each
Nine Assistants	GST (20) each

APPENDIX IV (O)

Teaching Load on the Deptt. of Botany.

Class	(L)	(GST, LDF)	(Sections)
2nd yr. Geology	4	8	1
2nd yr. Botany	7	13	1
3rd yr. Botany	12	15	1
4th yr. Botany	8	15	1
4th yr. 4 Electives	20	29	..

Lecture Load $=4+7+12+8+20=51$ hours/week.

GST, LDF-Load $=3(8+13+15+15+20)=3\times71=213$ hours/week.

STAFF REQUIRED

One Professor	L (7)
Three Asstt. Professors	L (8) GST (6) each
Two Lecturers	L (10) GST (6) each
Ten Assistants	GST (20) each

APPENDIX IV (P)

Teaching Load on the Deptt. of Meteorology

Class	(L)	(GST, LDF)	(Sections)
3rd yr. Meteorology	7	9	1
4th yr. Meteorology	8	15	1
4th yr. 4 Electives	20	20	..

Lecture Load =7+8+20=35 hours/week.

GST, LDF-Load =3 (9+15+20)=3×44=132 hours/week.

STAFF REQUIRED

One Professor	L (8)
Three Asstt. Professors	L (9) GST (5) each
Six Assistants	GST (20) each

APPENDIX IV (Q)

Teaching Load on Workshops.

1st yr. class about 500 students.

2nd yr. class about 240 students.

Shops :—1.	Carpentry	120 seats in each shop. 10 Instructors in each.
2.	Smithy	
3.	Welding and Tin Smithy	
4.	Masonry	
5.	Fitting	
6.	Foundry and Pattern Making	80 seats in each shop.
7.	Machine Shops	10 Instructors in each.
8.	Mill Wright	
9.	Instrument makers	40 seats in each shop. 5 Instructors in each.
10.	Engine and Boiler House	
11.	Electrician	

STAFF REQUIRED

One Workshop Superintendent.
Eleven Foremen Instructors.
Twelve Store Keepers.
Eighty Five Artisan Instructors.

NOTE :—It may be possible to train about 600 trade apprentices in addition to providing practical instruction to students.

APPENDIX V.

Possible Strength of Post Graduate Departments.

Chemical Engineering Chemistry, Metallurgy etc.	400 Students.
Civil Engineering and Regional Planning	150 ,,
Mechanical Engineering	150 ,,
Electrical Engineering	200 ,,
Applied Physics, Meteorology, Geophysics	50 ,,
Botany and Biological Sciences	50 ,,
TOTAL ..	1,000 Students.

APPENDIX V (i)

Provisional Additional Staff Requirements for Post Graduate Work

Chemical Technology	4	Associate Professors.
Civil Engineering and Building	2	,, ,,
Mechanical Engineering	2	,, ,,
Electrical Engineering	3	,, ,,
Applied Physics etc.	1	,, Professor
Botany and Biological Science	1	,, ,,
	and 100 Research Assistants	

APPENDIX VI.

Teaching Staff Requirement.

Department.	Senior Professors.	Professors.	Associate Professors.	Asstt. Professors.	Lecturers.	Instructors or Asstts.	Research Asstts.
1. Mathematics and Statistics ..	..	2	..	1	9	14	5
2. Physics	..	1	1	1	4	10	5
3. Meteorology	1	..	..	3	..	6	5
4. Chemistry	..	1		1	4	16	
5. Chemical Engineering	1	1	4	4	..	9	25
6. Metallurgy	1	..		4	..	5	
7. Humanities	..	..	..	2	12	4	..
8. Drawing	..	..	..	1	1	25	..
9. Applied Mechanics	1	..	..	1	6	15	10
10. Civil and Sanitary Engineering ..	1	1	2	4	3	15	10
11. Building Construction	1	1		4	..	17	
12. Mechanical Engineering ..	1	1	2	6	3	23	10
13. Electrical Engineering	1	1	3	6	3	21	15
14. Aeronautical Engineering ..	1	..	..	3	1	7	5
15. Geology and Geophysics ..	1	..	..	3	3	9	5
16. Botany, Biology etc.	1	..	1	3	2	1p	5
TOTAL ..	11	9	13	47	51	206	100

	Workshop Staff Requirement			
	Supdt.	Foremen	Storekeepers	Artizans. Instructors
Workshop ..	1	11	12	85

Administrative Staff

Officers :—
- Principal
- Registrar
- Secretary
- Officer in charge of Practical Training
- Six Assistants to officer in charge of Practical Training
- Librarian
- Medical and Welfare Officers.

Others :—
- Twelve Physical Training Instructors
- Head Clerk
- Two Accountants
- Sixteen Departmental Clerks *cum* Librarian for Sub Libraries
- Twelve Library Assistants
- Sixteen Clerks
- Hundred Bearers etc.

APPENDIX VII.

Expenditure on Salaries to Staff (per month).

	Scale.	Minimum.	Maximum.
	Rs. Rs.	Rs.	Rs.
Principal	3,000—4,000	3,000	4,000
Eleven Senior Professors	1,500—2,000	16,500	22,000
Nine Professors	1,000—1,500	9,000	13,500
Sixty Assistant Professors	600—1,000	36,000	60,000
Fifty one Lecturers	300— 600	15,000	30,000
Three hundred and six Instructors & Assistants	20— 300	61,200	91,800
Workshop Supdt.	1,000—1,500	1,000	1,500
Eleven Foremen	300— 600	3,300	6,600
Eighty five Artisan Instructors or Assistants	80— 100	6,800	8,500
Registrar	1,600—1,500	1,000	1,500
Secretary	300— 600	300	600
Training Officer	1,500—2,000	1,500	2,000
Six Assistants to Training Officers	300— 600	1,800	3,600
Librarian	600—1,000	600	1,000
Welfare Officer	600—1,000	600	1,000
Twelve P. T. Instructors	100— 200	1,200	2,400
Forty Senior Clerks	300— 400	1,200	1,600
Forty three junior clerks	100— 300	4,300	12,900
Twelve Store keepers	100— 300	1,200	3,600
Hundred Bearers, etc.	50	5,000	5,000
	Rs.	1,7	

Mean expenditure per month.... Rs. 2,22,350

Annual mean salaries	,,	26,68,200
Leave Reserve Provident fund staff sabatical study expenses (10%)	,,	2,66,820
Total Rs.	..	29,35,020

APPENDIX VIII.

Probable Recurring Laboratory, Workshop, Scholarship and other charges, etc.

	Rs.
1. Workshop stores, Power Charges, etc.	6,00,000
2. Apparatus Replacemet, etc. Rs. 20,000 per department	3,20,000
3. Laboratory contingency Rs. 20,000 department	3,20,000
4. Library	60,000
5. Gas, Electricity etc.	20,000
6. Conservancy	60,000
7. Municipal Charges	60,000
8. Technical Journals (College Bulletins)	25,000
9. Athletic Grant at Rs. 1/- per month per student	36,000
10. Office expenses	40,000
11. Travelling Allowances, etc. for excursions and visits	40,000
12. 200 Research Scholarships at Rs. 100/- p. m.	2,40,000
13. 200 Practical Training Scholarships at Rs. 75/- p.m.	1,80,000
14. 400 Poverty Scholarships at Rs. 50/- p.m.	2,40,000
15. Miscellaneous	60,000
TOTAL Rs.	23,01,000

APPENDIX IX.

Summary of Recurring Expenditure.

	Rs
1. Salaries to staff, Provident Fund etc.	29,35,000
2. Other charges	23,01,000
3. Interest and sinking fund at 5% on Capital	15,43,000
TOTAL Rs.	67,79,000

APPENDIX X.

Anticipated Income.

	Rs.
1. Tuition fees from 2,000 students at Rs. 200 per year	4,00,000
2. Seat, furniture rent paid by 2,500 students at Rs. 100 per year	2,50,000
3. House Rent by deduction of 10% from salaries of Staff	2,66,000
4. Income from workshops	4,00,000
TOTAL Rs.	13,16,000

APPENDIX XI.

Net Recurring Expenditure.

	Rs.
Gross expenditure	67,79,000
Income	13,16,000
Net Expenditure Rs.	54,63,000

Thus expenditure per student per annum is expected to be about Rs. 1820/- which compares favourably with that at similar institutions abroad, for example in English Universities, the average cost is £. 125/- per student per annum to the institution and while in American Universities it is considerably more, about, Rs. 4,000/.

APPENDIX XII.

Accommodation in College Buildings.

I. ADMINISTRATIVE.

	Rs.	
Principal	600	sq. ft.
Vice-Principal	400	,,
Registrar	200	,,
Secretary	200	,,
Practical Training	400	,,
Practical Training Assistants	600	,,
Welfare Officer	300	,,
Typists' Room	600	,,
General Office	800	,,
Waiting Room	600	,,
Hall	600	,,
Board or Committe Room, etc.	600	,,
Workshop Superintendent	600	,,
Total	6,500	,,

II. Social Accommodation.

	Rs.	
Assembly Hall for 3,000 persons allowing 10 sq. ft. per person and providing High Table or Dias	32,000	sq. ft.
This would be used as Refectory and Examination Hall for about 1,500 persons	1,500	,,
Students Representative Council	1,000	,,
Students' Common Room	4,000	,,
Students Refectory Kitchen etc.	8,000	,,
Student Stationery and Bookshop	4,000	,,
Staff Room	4,000	,,
Gymnasium	6,000	,,
Total ..	59,000	,,

III. Library.

Main Library	10,000	sq. ft.
Reading Rooms	10,000	,,
Total ..	20,000	,,

IV. General.

Main Exhibition Hall and Model Room	10,000	sq. ft.

V. Store Room.

Office Store	900	sq. ft.
General Stores	1,700	,,
Sixteen Departmental Stores	10,000	,,
Total ..	12,600	,,

VI. Teaching Room.

Six Lecture galleries each for about 120 persons allowing 15 sq. ft. per person	10,800	sq. ft.
Eighty class rooms for 30 persons in each allowing 16 sq. ft. per person ..	38,400	,,
Total ..	49,200	,,

VII. Drawing Office.

Ten drawing offices each for 60 students allowing 25 sq. ft. per person ..	15,000	sq. ft.
Fifteen Senior Drawing Offices for 30 students in each allowing 40 sq. ft. per person	18,000	,,
Total ..	33,000	,,

VIII. Junior Laboratory Accommodation.

Junior Physics Laboratory for 6 students allowing 50 sq. ft. per person ..	3,000	sq. ft.
Junior Chemistry Laboratory for 60 students allowing 60 sq. ft. per person	5,000	,,
Junior Geology Laboratory for 30 students	1,500	,,
Junior Electrical Laboratory for 60 students	3,600	,,
Junior Heat Engine Laboratory for 60 students	4,000	,,
Junior Mechanics Laboratory for 60 students	3,600	,,
Total ..	20,700	,,

IX. Senior Laboratory.

	Rs.	
Strength of material laboratory for 30 students allowing 200 sq. ft. per person	6,000	sq. ft.
Hydraulics Laboratory for 30 students	9,000	,,
Heat Engine Laboratory	6,000	,,
Meteorology Laboratory	1,000	,,
Electrical Laboratory	8,000	,,
Metallurgical Laboratory	4,000	,,
Chemical Engineering Laboratory	9,000	,,
Botany Laboratory	4,000	,,
Building Construction Laboratory	6,000	,,
Geology	4,000	,,
Meteorology	3,000	,,
Aeronautics	4,000	,,
Total	64,000	,,

X. Research.

80 Research Rooms each 500 sq. ft. Total	40,000	sq. ft.

XI. Departmental Accommodation.

33 Professors' Rooms each 300 sq. ft.	9,900	sq. ft.
50 Assistant Professors' Rooms each 300 sq. ft.	15,000	,,
16 Sub Libraries each 600 sq. ft.	9,600	,,
16 Departmental Model Rooms and Exhibition Halls each 1,000 sq. ft.	16,000	,,
Total	50,500	,,

XII. Workshop Accommodation.

	Rs.	
Ten Workshops 4,000 sq. ft.	40,000	sq. ft.
Power House	8,000	,,
Total	48,000	sq. ft.

APPENDIX XIII.

Summary of Accomodation in the College Building.

	Rs.	
Administration	6,500	sq. ft.
Social Accommodation	59,000	,,
Library	20,000	,,
Exhibition Hall	10,000	,,
Stores	12,600	,,
Teaching Rooms	49,200	,,
Drawing Office	33,000	,,
Junior Laboratories	20,700	,,
Senior Laboratories	64,000	,,
Research Rooms	40,000	,,
Departmental Accommodation	50,500	,,
Workshops	48,000	,,
Total	4,13,500	,,
Adding 1/3rd for walls, Passage, cloak rooms, stair cases, etc.	1,37,850	sq. ft. (round).
Grand Total	5,51,350	sq. ft.

APPENDIX XIV.

Residential Accommodation.

I. STUDENTS.

	Rs.	
(*i*) Bed Study room for 3,000 students allowing 120 sq. ft. per person ..	3,60,000	sq. ft.
(*ii*) Dining Room at 25 sq. ft. per person for 3,000 students	75,000	,,
(*iii*) Kitchen, Stores, etc., ...	20,000	,,
(*iv*) 50 Wardens' Rooms 400 sq. ft. each	20,000	,,
(*v*) Hospital Dispensary etc., ...	12,000	,,
(*vi*) Sports Pavilion	10,000	,,
TOTAL ..	4,97,000	,,
Adding 1/3rd ..	1,66,000	sq. ft.
GRAND TOTAL ..	6,63,000	,,

II. STAFF QUARTERS.

Principal	3,000	sq. ft.
35 Senior Staff, each 2,000 sq. ft.	70,000	,,
120 Junior Staff, each 1,500 sq. ft.	1,80,000	,,
250 Bachelor quarters, each 400 sq. ft.	1,00,000	,,
150 Ministerial Staff quarters 1,000 sq. ft.	1,50,000	,,
200 Servant quarters 150 sq. ft.	30,000	,,
TOTAL ..	5,33,000	,,

Summary of Residential Accommodation.

Students	6,63,000	,,
Staff	5,33,000	,,
TOTAL ..	11,96,000	sq. ft.

APPENDIX XV.

Probable initial Capital Expenditure on Laboratory and workshop Equipment, Library.

	EXPENDITURE IN RUPEES.
1. Mathematics	30,000
2. Physics	2,00,000
3 Meteorology	3,00,000
4. Chemistry	6,00,000
5 Chemical Engineering	10,00,000
6 Metallurgy	6,00,000
7. Drawing	1,00,000
8. Applied Mechanics	6,00,000
9. Civil and Sanitary Engineering	4,00,000
10. Building Construction	6,00,000
11. Heat Engineering	6,00,000
12. Hydraulics	4,00,000
13. Electrical Engineering	12,00,000
14. Aeronautical Engineering	3,00,000
15. Geology and Geophysics	3,00,000
16. Botany	3,00,000
17. Workshops	25,00,000
18. Library	2,00,000
TOTAL Rs. ..	1,02,30,000

Probable cost of furniture.

	Rupees.
Hostel Furniture at Rs. 200 for 3,000	6,00,000
Class Room furniture at Rs. 50 for 3,000	1,50,000
Office	40,000
Library	60,000
Students Dining room at Rs. 20	60,000
Assembly Hall at Rs. 10	30,000
TOTAL Rs. ..	9,40,000

APPENDIX XVI.

Summary of Initial Capital Expenditure.

I. BUILDINGS.

		Rupees.
(*i*) College Building and workshop	5,51,350 sq. ft.	55,13,500
(*ii*) Students Residential accommodation	6,63,000 ,,	66,30,000
(*iii*) Staff quarters	5,33,000 ,,	53,30,000
(*iv*) Apparatus, Machine tools, Library etc.		1,02,30,000
(*v*) Furniture		9,40,000
(*vi*) Acquisition of 400 acres of land at Rs. 2,000 per acre		8,00,000
(*vii*) Water Supply, Roads and sewage plants, etc.		15,00,000
GRAND TOTAL ..		3,09,43,500

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BUREAU OF EDUCATION, INDIA

PAMPHLET No. 38

Proceedings of the First Meeting of All India Council for Technical Education held at New Delhi on the 30th April, 1st and 2nd May, 1946

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Proceedings of the first meeting of the all India Council for Technical Education held at New Delhi on the 30th April, 1st and 2nd May, 1946.

The first meeting of the All India Council for Technical Education was held at New Delhi on Tuesday, Wednesday and Thursday, April 30, May 1 and May 2, 1946, under the Chairmanship of Mr. N. R. Sarker. The Hon'ble Sardar Sir Jogendra Singh, Member of the Viceroy's Executive Council for the Departments of Education, Health and Agriculture opened the meeting.

The following members were present :

(1) Mr. N. R. Sarker—*Chairman.*

(2) Sir John Sargent, C.I.E., M.A., D.Litt., Educational Adviser to the Government of India.

Departments of the Government of India.

(3) Prof. J. N. Mukerjee, representing Agriculture Department.

(4) Mr. M. A. Mulky (Representative for Mr. R. K. Nehru, I.C.S.), representing Commerce Department.

(5) Dr. Sir S. S. Bhatnagar, O.B.E., D.Sc., F.R.S., representing Council of Scientific and Industrial Research.

(6) Mr. J. B. Shearer, O.B.E., I.C.S., representing Finance Department.

(7) Mr. S. H. Y. Oulsnam, C.I.E., M.C., I.C.S., representing Department of Health.

(8) Mr. J. M. Shrinagesh, I.C.S., representing Department of Industries and Supplies.

(9) Mr. S. Lall, C.I.E., I.C.S., representing Labour Department.

(10) Mr. T.M.S. Mani, O.B.E., I.C.S., representing Department of Planning and Development.

(11) Sir Fredrick Tymms, C.I.E., M.C., representing Post and Air Department.

(12) Mr. W. G. Reid, representing Railway Department (Railway Board).

(13) Brigadier H. P. Cavendish, D.S.O., O.B.E., representing War Department.

(14) Mr. S. Neelakuntam, (Representative for Mr. D. L. Mazumdar, I.C.S.), representing Department of Works, Mines and Power.

(15) Mr. G. M. McKelvie, representing War Transport Department.

Council of State.

(16) The Hon'ble Rai Bahadur S. K. Das.

Legislative Assembly (Central).

(17) Pandit Govind Malaviya.

(18) Miss Maniben Kara.

(19) Sri S. T. Adityan.

(20) Sardar Narayanrao Ganpatrao Vinchoorkar.

Provincial Governments.

(21) Mr. S. Gopala Ayyar, representing Government of Madras.
(22) Mr. R. P. Patwardhan, representing Government of Bombay.
(23) Mr. A. K. Chanda, I.E.S. (Representative for the Hon'ble Minister for Education, Bengal), representing Government of Bengal.
(24) Mr. L. P. Singh, I.C.S., representing Government of Bihar.
(25) Sri Bijayanand Patnaik, M.L.A., representing Government of Orissa.
(26) Mr. T. Swaminathan, I.C.S. (Representative for the Hon'ble Minister for Industries, (U. P.), representing Government of U.P.
(27) Dr. V. S. Jha, representing Government of C.P. and Berar.

Indian States.

(28) Syed Ali Akbar, M.A. (Cantab.), representing Hyderabad Deccan State.
(29) Mr. J. Appaji Gowda, B.A. (Hons.), representing Mysore State.
(30) Major D. L. Deshpande, B.Sc. (Hons.), M.Sc. (Engg.), A.M.I. Mech. E., representing Travancore and Cochin. (The Madras States).

Industry, Commerce and Labour.

(31) Dr. K. A. Hamid, B.Sc., M.A., Ph.D. (Berlin), F.R.I.C., F.C.S. (Lond.), representing All India Organisation of Industrial Employers.
(32) Sir Shri Ram, representing Federation of Indian Chambers of Commerce and Industry.
(33) Dr. A. Waheed, Ph.D., representing Federation of Muslim Chambers of Commerce and Industry.
(34) Mr. G. V. Apte, representing The Employers Federation of India, Bombay.
(35) Sir Frederick Stones, O.B.E., representing The Employers Federation of India, Bombay.
(36) Mr. Indrajit Gupta, representing The All India Trade Union Congress.
(37) Prof. B. N. Banerjee, representing The Indian Federation of Labour, Delhi.
(38) Mr. M. A. Khan, representing The Indian Federation of Labour, Delhi.
(39) Mr. S. Guruswami, representing All India Railwaymen's Federation.

Central Advisory Board of Education.

(40) Sardar Bahadur Sardar Ujjal Singh.
(41) Mr. S. M. Azam.

Inter University Board (India).

(42) Sir A. L. Mudaliar, B.A., M.D., D.Sc., F.R.C.O.G., F.A.C.S.
(43) Prof. N. K. Sidhanta.

Association of Principals of Technical Institution (India).

(44) Mr. W. W. Wood, F.R.I.B.A., M.I.E. (India).

(45) Mr. P. N. Joshi, M.Sc. (Tech.).

The Institution of Engineers (India).

(46) Mr. N. V. Modak, C.I.E., J.P., B.E.M. Inst. V.E., M.I.E. (India), F. R. San. I.

Secretary.

Dr. S.R. Sen Gupta, Deputy Educational Adviser to the Government of India, Department of Education.

The following members were unable to attend :—

(1) The Hon'ble Khan Bahadur Keramat Ali of Assam representing Council of State.

(2) Mr. Muhammad Ismail Khan representing Legislative Assembly.

(3) The Hon'ble Minister for Industries or Director of Industries, representing Government of Assam.

(4) The Hon'ble Minister for Education, Sind, representing Government of Sind.

(5) The Hon'ble Minister for Education, Punjab, representing Government of Punjab.

(6) Mr. A. W. Johnstone, B.Sc., A.M.I.E.E., A.M.I.-Mech. E., representing Government of the N.W.F.P.

(7) Capt. H. C. Dhanda, representing Central India States, Holkar Government.

(8) Mr. R. G. Allan, M.A., C.I.E., representing (States of Western India) Gujrat and Baroda.

(9) Mr. A. S. Trollip, C.I.E., representing Associated Chambers of Commerce of India, Calcutta.

(10) Mr. W. F. Scott Kerr, representing Associated Chambers of Commerce of India, Calcutta.

(11) Mr. M. A. Master, representing All India Organization of Industrial Employers, Bombay.

(12) Mr. K. D. Jalan, representing Federation of Indian Chambers of Commerce and Industry, New Delhi.

(13) Mr. Chakkrai Chettiar, representing The All India Trade Union Congress.

(14) Mr. Fazal Ibrahim Rahimtoola, C.I.E., B.A., nominated by the Government of India.

The following gentlemen were present by special invitation :—

Mr. R. B. Elwin of the War Transport Department, Government of India.

Mr. C. E. Preston of the Education Department, Hyderabad State.

The agenda for the meeting is included in Appendix I.

2. At the opening of the session, Sardar Sir Jogendra Singh, the Hon'ble Member of the Viceroy's executive Council for the Departments of Education, Health and Agriculture, welcomed the members of the Council. He said,

"Mr. President and gentlemen, on behalf of the Government of India I offer you a very warm welcome to this most important Coun-

cil. When I was a Minister in the Punjab I was trying to promote productive activity at one of the colleges that was in my charge, known as the Maclagan Engineering College, in co-operation with the Principal, Mr. Whittaker, who was as keen in training his boys and in giving them proper education as I was. But, unfortunately, we did not succeed in giving the education that we wanted to give. Today as you know, we have very few production engineers. We have engineers who are familiar with the theory and are ready to do what they can in that matter but what India needs at the present moment are technicians who can produce the articles that we need and for this purpose I hope your Council will be able to give us schemes which the Government of India can implement, so that we can have engineers who can produce what India needs in the matter of new machines.

" In these days of technology it is necessary that India should be in a position to make her own machines, not only be able to repair them but also to make them. At present, as we know, if you send a fan like this to a factory to put it right, it will perhaps come back with more creaks than when you sent it for repair and it is necessary that this should not happen any more.

" You have been very fortunate in having as your President my old colleague Mr. N. R. Sarker, and I am sure under his inspiring leadership you will produce a scheme which will be for the permanent good of India.

" We are hoping that you will be able not only to survey the needs but also the means that are required to implement your recommendations.

" As you know, under the inspiration of the Planning Department, particularly due to my old friend, the Planning Member, who resigned so early, we have been sending students abroad for fuller training in matters for which scholarships have been arranged. We have sent abroad now nearly 300 students last year. Another selection has been made for sending abroad a fairly large number of students for getting technical training.

" Sir Ardeshir Dalal was extremely anxious that India should have technical institutions on the same lines as the M.I.T. in America and it was under his guidance that the Sarker Committee was constituted. Well, the M.I.T. in America is a very old institution on which they have spent millions and it occupies a fairly large area in the state in which it exists. It has been suggested that India is such a wide country that it would be necessary to have at least one institution of the kind for the Eastern Zone somewhere in Calcutta, another for the Western Zone somewhere in Bombay, a third for the Northern Zone somewhere in Cawnpore and a fourth for the South somewhere in Madras.

" We should not only establish these institutions but also equip them fully with engineers who are familiar with production and this is the most important thing that in any institution we set up we should have men of the highest quality whether we get them from India or

from abroad (England or America) so that education may proceed on proper lines. I wish to emphasise this side of the question before this Council, because in the matter of those who have got to train our men we must get men of the highest possible quality.

" In addition Government have approved the establishment of a Power Engineering Department at the Indian Institute of Science, Bangalore, a Technical Teachers' Training College in Delhi and among the schemes before the Council for examination also a Central College for Town and Regional Planning and an Administrative Staff College. These are some of the suggestions and I hope your Council—and it is a Council of experts—will be able to give early guidance to the Government so that the matter could be proceeded with as soon as possible.

" I am grateful to you and particularly to my friend Mr. N. R. Sarker for accepting the presidentship of this Council and I now wish you Godspeed in your deliberations and I hope your deliberations will bear early fruit ".

3. In his reply to the Honourable Member's address of welcome Mr. N. R. Sarker said,

" Sardar Sir Jogendra, on behalf of the members of this Council and on behalf of myself I must thank you very sincerely for your taking the trouble of attending this first session of the All India Council for Technical Education which the Government of India have established. It indicates the great interest that you take in the work of the Council. In spite of the fact that you have suffered a very recent bereavement, and your health is not very good nowadays, that you have taken the trouble of coming to us and welcoming the members of this Council augurs well and it will be a very great encouragement to the members of this Council.

" I must also thank the Government of India for taking up the question of this higher technical education in right earnest and if their policy is persistently and earnestly pursued I think a great impediment to our progress can be removed. As you know, not only in a backward country like India but even in advanced countries like England, higher technical education has taken on a new emphasis ; they are trying to improve their technical education quantitatively and qualitatively and in a backward country like India if a good comprehensive plan for economic improvement and raising the standard of living of the masses is to be implemented, one of the greatest bottle-necks that is to be overcome, is the lack of technical personnel, rather than the question of finance and we are grateful to the Government of India for taking up in right earnest this matter of technical education. Technical education in our country has become all the more necessary now because of the lack of technological personnel from more industrially advanced countries and the difficulty of obtaining the technical " know-how " from such countries. Even when foreign technical experts are available for India, more often than not one of the conditions precedent that is usually demanded by them for such help is some form of control of the industry concerned which we naturally cannot

countenance at this stage. Therefore the quicker we can arrange for training our own personnel the better for this country. We know the besetting difficulties and the enormity of the problem ; but I can assure the Hon'ble Member that this Council will do its best to fulfil the task entrusted to it and I hope and trust that the Government will provide this Council with all the facilities it needs. I again thank you, Sir Jogendra, for your coming and inaugurating this meeting of the Council ".

4. The chairman then invited the members to consider the items on the agenda.

ITEM No. 1.

To record the Resolution of the Government of India in the Department of Education No. F.16-10|44-E.III, dated the 30th November, 1945, establishing the All-India Council for Technical Education and the amendment thereto, No. F. 16-26(7)|45-E.III., dated the 21st February, 1946.
(*Appendix* 2).

Resolved that the resolution of the Government of India in the Department of Education No. F.16-10|44-E.III., dated the 30th November, 1945, establishing the All-India Council for Technical Education and the amendment thereto No. F.16-26(7)|45-E.III, dated the 21st February, 1946, be recorded.

ITEM No. 2.

To report the present membership of the Council as constituted in accordance with the terms of the Resolution of the Government of India referred to above. (*Appendix* 3).

It was reported that owing to the bifurcation of the Government of India Department of Labour into the Department of Labour and the Department of Works, Mines and Power, Mr. D. L. Mazumdar now represented the Department of Works, Mines and Power.

Resolved that with this alteration the list of members (which had been already circulated, be recorded.)

ITEM No. 3.

To consider whether any additions or alterations to the membership of the Council are desirable to enable it to fulfil its functions efficiently and to recommend to the Government of India accordingly.

The Council considered requests for representation on the All India Council for Technical Education from the following organisations :—

(A) Those who already have one representative on the Council :—

	Additional seats asked for.
(1) Government of the United Provinces ..	2
(2) Institution of Engineers (India) at least ..	2

(B) Those who are not represented on the Council :—

	No. of seats asked for.
(1) Orissa Industries Association, Cuttack.	not mentioned.
(2) The Karnataka Defence League, Bellary.	not mentioned.

(3) The All India Manufacturers Organisation, Bombay.	1
(4) The Indian Institute of Art in Industry, Calcutta.	1
(5) Baluchistan Administration ..	1
(6) Central Board of Irrigation, Government of India.	at least 2
(7) The Indian Institute of Architects, Bombay.	not mentioned.
(8) Indian Chemical Society, Calcutta.	at least 2
(9) Anjuman-i-Himayat-i-Islam, Lahore.	1
(10) The Benares Hindu University.	2

In addition to the above, it was proposed by Mr. Sant Singh, Ex-M.L.A. Central that Mr. S. M. Illahi, Agricultural Engineer to the Punjab Government, Lyallpur, be made a member of the All India Council for Technical Education.

It was also suggested at the meeting that the National Planning Committee should also be represented on the All-India Council for Technical Education.

Although the Council were generally of the opinion that any substantial increase in the membership might prove detrimental to the efficient discharge of business and therefore were generally not in favour of recommending such an increase, they came to the conclusion that the National Planning Committee and the Indian Institute of Architects ought to be represented on the Council and that the Institution of Engineers should be given an additional seat.

The Council were also of the opinion that various Committees through which so large a body would have to work should consist primarily of technical men and this would afford the opportunity to give representation to bodies or whom places could not be found on the Council itself.

Resolved that the Government of India be requested to enlarge the All India Council for Technical Education by the inclusion of two representatives of the National Planning Committee, one representative of the Indian Institute of Architects and an additional representative of the Institution of Engineers.

ITEM No. 4(a).

To report the agreement arrived at between the Departments of Education and Labour of the Government of India in regard to their respective functions in the field of technical instruction and training so far as the Central Government is concerned. (*Appendix* 4).

In recording the agreement arrived at between the Departments of Education and Labour of the Government of India in regard to their respective functions in the field of technical instruction and training in so far as the Central Government is concerned, the Council expressed the opinion that the Education Department should co-ordinate the activities of other Departments in the matter of Higher Technical Education

and remove any anomalies that may exist in the demarcation of the respective functions of the different Departments of the Government of India.

It was further felt that the Governments of the Provinces and the States would be well advised to secure similar co-ordination between their respective departments in the matter of Higher Technical Education.

ITEM No. 4(b).

To consider the Labour Department Memorandum on the Report of their advisory Committee on Technical Training for training and apprenticeship of craftsmen for industry and to make recommendations.

The Memorandum on the Report of the Advisory Committee on Technical Training and Apprenticeship for Craftsmen in Industry and the Reports in original were then considered. During the discussions on this subject, the importance of the standardisation of wages, the provision of facilities for further education for skilled and semi-skilled personnel already engaged in industry and the danger of excessive turnover of technicians were emphasised.

After discussion, the Council passed the following resolution :—

" The Council approves in general the recommendations made by the Advisory Committee on Technical Training and urges upon the Government the necessity of implementing at an early date these recommendations. The Council suggests that the Regional Technical Committees should work under, and report from time to time to the All India Council for Technical Education ".

ITEM No. 5.

To receive and consider the Interim Report prepared by the ad hoc *Committee known as the Higher Technological Education Committee set up by the Government of India in the Department of Education to consider the establishment of Higher Technical Institutions in India on the lines of the Massachusetts Institute of Technology and to make recommendations.*

The Interim Report of the Sarker Committee on the establishment of Higher Technical Institutions was then considered. The attention of the members was invited in this connection to the Percy Committee Report which appeared on item 14 of the agenda and it was agreed that the two Reports should be considered together.

As the Sarker Committee Report was the most important item on the agenda the best part of a day was devoted to the discussion of it.

The Council expressed their appreciation of the work of the Sarker Committee and were generally agreed that the provision of improved and extended facilities for Higher Technical Education was a pressing necessity.

The opinion of the Council was, however, divided as to the best way of securing the desired object. Some members felt that this could best be done by strengthening the existing technical colleges in the first instance ; others while agreeing about the necessity of strengthening of existing institutions were of opinion that this by itself would not be sufficient to satisfy the country's urgent need for a greatly increased supply

of high-grade technologists and that consequently the establishment of the four Higher Technical Institutions, as recommended by the Sarker Committee, could not be deferred. There was also some difference of opinion as to the advisability of conducting a survey of existing facilities and of the probable demands for highly trained technologists before setting up these institutions. The view of the majority, however, was that while under normal circumstances such a survey would have been desirable, the present shortage of high grade technologists was so acute and the numbers required of such personnel was so large that the four institutions recommended to be established would in any case not be able to train more technical personnel than the country needs, so that the establishment of the above institutions ought not to be delayed pending such a survey, which would necessarily take a considerable time.

After some discussion the following two resolutions were moved :

Resolution No. 1.

" That a committee of eleven (11) members be set up to consider the scheme prepared by the Sarker Committee and the proposals contained in the appendices III, III(a), V, VI, VII, X, XI and XII of the agenda circulated for this meeting and in the light of the present discussion and this resolution to place before this Council a comprehensive and co-ordinated scheme to cover all the stages of

1. Vocational and technical training and

2. Higher technical education and research based on the standards of well known institutes of technology.

" The Committee shall be empowered to co-opt as many more members as it thinks necessary for proper fulfilment of the functions of the committee.

" It will also be empowered to invite and receive opinions and suggestions from the National Planning Committee and other suitable public bodies, institutions and individuals on the schemes and proposals mentioned above, and, if it considers necessary, to visit such of the existing institutions in the country, as it may consider desirable.

" The Committee will submit its report by the 31st December 1946 ".

Resolution No. 2.

" This Council agrees with the opinion expressed in the interim report of Sarker Committee that there should be established four Higher Technical Institutions in this country which should be located in East, West, North and South ;

" That the exact location of these institutes should be decided by the Council on the recommendations of the Regional Committees which should in recommending the location take into consideration the facilities available in the locality, the existence of Engineering, Technical and Technological Institutes, University Colleges and research facilities and the particular industries existent in the area concerned ;

" That in the event of there being delay in the setting up of all the four institutes such institute or institutes which may first be

started should cater for the needs of all provinces, it being understood that as and when all the institutes are started, each institute would cater for the needs of a definite area so that the students of all the provinces may have opportunities made available to them for technical education ; and that the needs of provinces backward in facilities for education in engineering and technology such as C.P., Orissa, Assam, the N.W.F.P. be specially taken into consideration ;

" That if any particular type of Technical education is made available at only one or two centres, such centres should cater to the needs of all the provinces.

" That a special committee or committees be appointed to consider and report in detail on the suggestions made in the Sarker Committee regarding the curricula of study to be pursued for each of such courses :

" This Council is of opinion that it is most urgent with a view to upgrade existing institutions, Engineering and Technological, that generous grants should be given by the Governments, Central and Provincial and that with this end in view a committee be appointed with power to co-opt and make specific recommendations to the Government of India to improve the existing engineering and technological institutes and to ensure their efficient working ".

The first resolution was put to the vote and was not carried.

The following amendment to the second resolution was then moved :

Amendment to Resolution 2.

Para I to be amended to read :

" This Council places on record its appreciation of the work done by the Sarker Committee and having considered its interim report, is of the opinion that there should be established Five Higher Technical Institutes in the country which should be located in East, West, North and South and the Centre.

" After para II to be added the following new paras. :—

(a) That these institutes should at present be confined to carrying on research and providing specialised post-graduate training and education in all the branches of technical and technological subjects, particularly those required immediately in the interests of industry and the economic development of the country.

(b) That the existing Engineering, Technical, Technological and University institutions all over the country should be utilised for immediately providing education, and training up to the graduation stage as set forth in the Sarker Report.

(c) That a special committee should be set up immediately to recommend the necessary grants and assistance to the existing institutions to enable them to fulfil the above purpose satisfactorily and without delay.

(d) That, later on, in the light of experience gained, if it is found desirable and necessary, graduate classes may be added to the Four Higher Technical Institutes also.

" Para V is to be substituted with resolution No. I ".

This amendment, when put to the meeting, was not carried.

The second resolution was then put to the vote clause by clause, each of which was carried by a substantial majority.

ITEMS NOS. 6, 7 AND 8.

6. *To consider whether it is desirable to establish separate committees of the Council to deal with the main or special branches of technology and if so, to determine :—*

(a) *the subjects for which such committees will be required in the first instance, and*

(b) *their constitution.*

7. *To consider whether to appoint—*

(i) *regional committees in pursuance of the recommendation of the Administration committee of the Central Advisory Board of Education viz. "The All India Council for Technical Education should have regional committees which may cover the areas of one or more provinces"; and/or*

(ii) *a special Committee of the Council to survey the facilities, existing or proposed, for technical education in the areas to be served by each of the proposed Higher Technical Institutions and to advise as to the best way of co-ordinating these facilities with the work of the new institutions.*

8. *To consider the position of the All-India Boards of Examination in the main branches of technology set up under the auspices of the Association of Principals of Technical Institutions (India) and to recommend as to the advisability of their being,*

(i) *recognised as separate bodies under the aegis of the Council, or,*

(ii) *affiliated with the Council, and in case (i) is recommended, to consider whether to appoint representatives of the Council on these All India Board.*

The Council decided that as items 6, 7 and 8 of the agenda were closely interlinked with one another, it would be best to consider them together. They appointed a sub-committee to consider these items keeping in view the resolution adopted by the Council in regard to item 5 of the agenda and to report to the Council. The Sub-Committee consisted of :—

Sir A. L. Mudaliar (*Convener*).
Mr. G. V. Apte.
Sir S. S. Bhatnagar.
Mr. P. N. Joshi.
Mr. G. L. Mehta.
Mr. N. V. Modak.
Prof. J. N. Mukerjee.
Mr. C. E. Preston.
Sir Fredrick Stones.
Mr. W. W. Wood.
Dr. S. R. Sen Gupta (*Secretary*).

In view of the objectives envisaged in the three items of the agenda, viz :—

(i) to advise on the content of education and the standard of institutions ;

(ii) to award All-India Diplomas in Engineering and Technology, and

(iii) to survey the facilities for Higher Technical Education throughout the country ;

the Sub-Committee recommended the establishment of three types of Committees. At the Centre there shall be a Committee of the Council to be called the Co-ordinating Committee, the word "co-ordinating" expressing the functions which this Committee would be expected to perform. Secondly there would be subject Committees (or Boards of Technical Studies) one for each of the main subjects of Technology. Lastly there would be Regional Committees which might be established on somewhat the same lines as the All India Council and would perform such duties as were assigned to them by the Council. The Sub-Committee and the Council expressed their appreciation of the good work already done in this connection by the Association of Principals of Technical Institutions (India). The constitution and functions of these different committees and Boards as envisaged by the sub-committee and subsequently approved by the Council are set out in greater detail below.

I. Co-ordinating Committee of the A.I.C.T.E.

(a) *Constitution.*

The Co-ordinating Committee of the Council will consist of not more than 12 members besides the Chairmen of the Boards of Studies who shall be ex-officio members of the Co-ordinating Committee. The Chairman of the Council shall be ex-officio Chairman of the Co-ordinating Committee and the Educational Adviser to the Government of India will be an ex-officio member. The Secretary of the Council will act as Secretary to this Committee. The other members of the Committee shall be as follows :—

One member elected by the representatives of Provincial Governments in India from among their own members on the All India Council for Technical Education.

One member elected by the representatives of the Council of State and Legislative Assembly from among their own members on the All India Council for Technical Education.

One member elected by the representatives of Provincial Governments from among their own members on the All India Council for Technical Education.

One member elected by the representatives of the Indian States from among their own members on the All India Council for Technical Education.

Two members—one to represent Employers and one to represent Employees to be elected from among their own members by the representatives of Industry, Commerce and Labour on the All India Council for Technical Education.

One nominee of the representatives of the Central Advisory Board of Education and Inter-University Board from among their own members on the All India Council for Technical Education.

One nominee from the representatives of the Professional Associations on the Council (Association of Principals of Technical Institutions (India), Institution of Engineers and Indian Institute of Architects) from among their own members on the All India Council for Technical Education.

Two representatives nominated from among the members of the Council by the Chairman to represent interests not otherwise adequately represented.

The Co-ordinating Committee shall be constituted for a period of 3 years ; the period of office of the first Co-ordinating Committee to expire on the 30th June, 1949.

(b) *Functions*

The Co-ordinating Committee shall consider all recommendations made by the Boards of Technical Studies concerned and shall, subject to the nature of the subject :—

(a) place them before All India Council for Technical Education with its recommendations,

or

(b) pass its decision thereon.

It shall nominate where necessary members to the respective Boards of Technical Studies.

It shall have power on the recommendations of the Regional Committees and the Boards of Technical Studies concerned to grant recognition to such institutions as have been inspected and reported on.

It shall authorise the grant of Certificates and Diplomas on the results of examinations conducted by duly constituted examining Boards, such certificates being signed by the Chairman of the Council, the Secretary of the Council and the Chairman of the Board of Technical Studies concerned.

It shall approve the recommendations of the Board of Technical Studies concerned.

It shall correspond with and receive reports from the Regional Committees and shall co-ordinate the work of the Regional Committees where necessary.

It shall take all such other measures as may be necessary for the proper fulfilment of the duties of the Council.

II. *All India Boards of Technical Studies.*

(a) *Constitution.*

All India Boards of Technical Studies shall be constituted for the different subjects of Engineering and Technology and as a first measure such Boards shall be constituted for the following branches of study :

(i) Engineering and Metallurgy.

(ii) Architecture and Regional Planning.

(iii) Commerce, Business Administration and Economics.

(iv) Chemical Engineering and Technology.

(v) Textile Technology.

(vi) Applied Art.

Each of these All India Boards of Technical Studies will consist of 12 members with power to co-opt not more than 3 members for any particular specialised branch of study.

The Boards will be constituted as follows :

Representative of the All India Council for Technical Education	1
Representative of the Association of Principals of Technical Institutions (India)	2
Representative of the Employees	1
Representative of the Employers	1
Representative of the Professional Bodies concerned.	2
Representative of the Inter University Board ..	1

and 4 other specialists to be nominated by the Co-ordinating Committee.

The Co-ordinating Committee shall be responsible for nominating members to the Boards of Technical Studies concerned where necessary. In the case of organizations of Employees and Employers where there is more than one organisation concerned with the particular Board, each such recognised organisation will be requested to forward a name and from the panel thus submitted the Co-ordinating Committee shall select the member.

The existing personnel of the All India Boards of Studies constituted by the Association of Principals of Technical Institutions (India) should be nominated in the first instance as the members of the new Boards of Studies and such vacancies as may be left over be filled in conformity with the lines laid down above.

The period of office of these Boards should be 3 years subject to the proviso that a person elected from a particular constituency shall continue to be on the Board so long as he continues to be member of the particular constituency.

The Boards constituted by the Association of Principals of Technical Institutions should function till 31st December 1947 and the Chairmen already appointed for respective boards should be requested to continue as such for the rest of the period. Thereafter the Chairmen should be elected by the Boards concerned.

The Boards should ordinarily meet twice a year but it will be open to the Chairman to summon meetings of the Boards as and when necessary.

(b) *Function.*

(i) To examine the existing regulations and syllabuses for certificates and diplomas in the different provinces and to frame definite regulations governing the grant of—

(a) All India Certificates,

(b) All India Diplomas,

(c) Higher Diploma of the Higher Technical Institutions.

(2) To recommend what conditions should be prescribed for recognition of the different types of technical institutions taking into consideration—

(a) qualification, nature and number of teaching staff required and conditions of service

(b) accommodation needed for teaching purposes and for staff and students

(c) the nature and extent of the equipment required

(d) facilities for practical training, and

(e) such other conditions as may be required for the recognition of the institutions.

(3) To recommend persons who should be appointed as inspectors and visitors to report on the conditions of the institutes with a view to the grant of initial recognition or continuation of recognition.

(4) To recommend the names of persons who may be appointed as external examiners ;

(5) To suggest names of assessors who will visit the centre, report on the soundness and standard of examinations ;

(6) To perform such other duties as may be necessary for the fulfilment of the above purpose or as may be prescribed by the Co-ordinating Committee.

III. *Regional Committees.*

(a) *Constitution.*

There should be constituted Regional Committees composed of representatives of Governments, industry and Labour, technical institutions and Universities and professional bodies in the area concerned.

(b) *Functions.*

(i) To supervise the work of the technical institutions within the area.

(ii) To appoint Boards of Examiners, taking into consideration the recommendations of the Boards of Technical studies concerned and to arrange for the proper conduct of examinations.

(iii) To publish the results of the examinations.

(iv) To send reports to the Co-ordinating Committee about the conduct of examinations periodically.

(v) To make preliminary examination of any institution seeking recognition and to forward recommendations to the Co-ordinating Committee.

(vi) To survey the facilities for technical education and to make recommendation thereon to Co-ordinating Committee.

The Council then proceeded to elect members to the Co-ordinating Committee and the Boards of Technical Studies. The following members were elected to the Co-ordinating Committee :

Sir S. S. Bhatnagar representing the representatives of the Government of India.

Pt. Govind Malaviya representing the representatives of the Legislature.

Dr. V. S. Jha representing the representatives of the Provinces.

Major D. L. Deshpande representing the representatives of the Indian States.

Dr. K. A. Hamied representing the representatives of the Employers.

Prof. B. N. Banerjee representing the representatives of Employees.

Sir A. L. Mudaliar representing the representatives of the Central Advisory Board of Education and the Inter University Board.

Mr. N. V. Modak representing the representatives of the Professional Associations on the Council.

Representatives of the All India Council for Technical Education elected to the Boards of Technical Studies were :

Mr. G. V. Apte on the Board of Engineering and Metallurgy.

Mr. D. L. Mazumdar on the Board of Architecture and Regional Planning.

Dr. J. N. Mukerjee on the Board of Chemical Engineering and Technology.

Sir Frederick Stones on the Board of Textile Technology.

Dr. A. Waheed on the Board of Commerce, Business Administration and Economics, and

Miss Maniben Kara on the Board of Applied Arts.

It was agreed that the Regional Committees should be set up by the Chairman of the All India Council for Technical Education in consultation with the Educational Adviser to the Government of India.

The Council expressed their appreciation of the service rendered by Sir A. L. Mudaliar as convener of the Sub-Committee.

ITEM No. 9.

To consider the proposal of the Indian Institute of Science, Bangalore for the establishment of a Post-graduate Power Engineering Department at the Institute and to make recommendations.

The scheme for the establishment of the Power Engineering Department at the Indian Institute of Science was examined. In view of the important Power Development Schemes which are under the consideration of the Governments the Council passed the following resolution :

" The Council strongly supports the proposal for the establishment of the Power Engineering Department at the Indian Institute of Science in Bangalore and recommends to the Government of India that the scheme be implemented without delay.".

ITEM No. 10.

To consider the proposal for the establishment of an Institute of Indian Architecture and Regional Planning and to make recommendations.

The Council accepted the views expressed by the present All India Board of Studies in Architecture that the scheme submitted by Major Marshall and Mr. Chatterjee for a Central Institute of Town and Regional Planning was not satisfactory. In view of the importance of the need for educational facilities for Town and Regional Planning, the Council adopted the following resolution :

"The Board of Technical Studies in Architecture and Regional Planning be directed to draw up a comprehensive scheme for the establishment of a Central Institute for Architecture and Town and Regional Planning and to submit it for the consideration of the Co-ordinating Committee. In preparing the Scheme the Board should invite opinion from outside experts and allied interested bodies".

ITEM No. 11.

To consider the scheme for the Post-War Education and training of Engineering personnel in India prepared by Mr. C. E. Preston, Principal, Osmania Technical College, Hyderabad-Deccan and to make recommendations.

It was decided that Mr. Preston's paper on the "Post-war Education and Training of Engineering Personnel in India", be referred to the Board of Technical Studies in Engineering and Metallurgy for consideration and for submission of their recommendations if any, to the Co-ordinating Committee.

ITEM No. 12.

To consider the advisability of inviting an engineer of eminence from abroad to advise on the improvement of Engineering Education in India and to make recommendations.

It was decided to postpone the consideration of the question of inviting an engineer of eminence from abroad to advise on the improvement of engineering education in India.

ITEM No. 13.

To consider the advisability of providing facilities for advanced instruction in Highway Engineering.

It was decided to refer the question of the provision of facilities for advanced instruction in Highway Engineering to the Board of Technical Studies in Engineering and Metallurgy and to direct that Board to submit its recommendations to the Co-ordinating Committee.

ITEM No. 14.

To consider the Percy Committee Report on Higher Technological Education in England and Wales and to make recommendations.

It was felt that most of the ground covered by the Percy Committee Report had also been covered by the Sarker Committee Report and the Council's decisions on items 5, 6, 7 and 8 of the Agenda. It was decided that the Percy Committee report should be recorded.

ITEM No. 15.

To consider the article on a proposed Administrative Staff College in England by Sir Hector Hotherington, Vice-Chancellor of the Glasgow University.

It was felt that the establishment of an Administrative Staff College was not a pressing necessity and it was decided that the matter be referred to the Co-ordinating Committee for further examination.

ITEM No. 16.

To consider the desirability of appointing a Committee to expedite the recognition of degrees in engineering given by the Indian Universities by the professional engineering institutions in the United Kingdom.

The Council was of the opinion that the Indian University degrees in Engineering and Technology should receive recognition from foreign universities and professional institutions and it was decided that the Co-ordinating Committee should examine the question and suggest for the consideration of the A.I.C.T.E. steps that should be taken to secure such recognition in U.K. and elsewhere.

Additional items not on the agenda.

(1) The resolution of the meeting of the Standing Committee of the Indian Legislature on Education which met in Simla on the 8th, 9th and 10th August 1945 was circulated to members for information. The resolution was recorded.

(2) The request from the Mayurbhanj State Secretariat, for a survey of that State for the purpose of establishing technical institutions was then considered. It was decided that this matter should be referred to the Eastern Regional Committee when established.

(3) With a view to clarifying items on the Agenda, where necessary, and generally to facilitate the expeditious carrying out of the Council's business it was agreed that the Co-ordinating Committee or a special committee appointed by it should be asked to consider the agenda a day or two before the meetings of the All India Council for Technical Education.

The Council then adjourned with a vote of thanks to the chair.

APPENDIX 1.

MEETING OF THE ALL INDIA COUNCIL FOR TECHNICAL EDUCATION, HELD ON THE 30TH APRIL, 1ST AND 2ND MAY 1946.

AGENDA.

1. To record the Resolution of the Government of India in the Department of Education No. F.16-10|44-E.III, dated the 30th November, 1945, establishing the All India Council for Technical Education and the amendment thereto, No. F.16-26(7)|45-E.III, dated the 21st February, 1946. (Appendix 2).

2. To report the present membership of the Council as constituted in accordance with the terms of the Resolutions of the Government of India referred to above. (Appendix 3).

3. To consider whether any additions or alterations to the membership of the Council are desirable to enable it to fulfil its functions efficiently and to recommend to the Government of India accordingly.

4. (a) To report the agreement arrived at between the Departments of Education and Labour of the Government of India in regard to their respective functions in the field of technical instruction and training so far as the Central Government is concerned. (Appendix 4).

(b) To consider the Labour Department Memorandum on the Report of their Advisory Committee on Technical Training for training and apprenticeship of craftsmen for industry and to make recommendations.

5. To receive and consider the Interim Report prepared by the *ad hoc* Committee known as the Higher Technological Education Committee set up by the Government of India in the Department of Education to consider the establishment of Higher Technical Institutions in India on the lines of the Massachusetts Institute of Technology and to make recommendations.

6. To consider whether it is desirable to establish separate committees of the Council to deal with the main or special branches of technology and if so, to determine—

(a) the subjects for which such committees will be required in the first instance, and

(b) their constitution.

7. To consider whether to appoint

(i) regional committees in pursuance of the recommendation of the Administration Committee of the Central Advisory Board of Education, viz. "The All India Council for Technical Education should have regional committees which may cover the areas of one or more provinces", and|or

(ii) a special Committee of the Council to survey the facilities, existing or proposed, for technical education in the areas to be served by each of the proposed Higher Technical Institutions and to advise as to the best way of co-ordinating these facilities with the work of the new institutions.

8. To consider the position of the All India Boards of Examination in the main branches of technology set up under the auspices of the Association of Principals of Technical Institutions (India) and to recommend as to the advisability of their being—

(i) recognised as separate bodies under the aegis of the Council, or,

(ii) affiliated with the Council, and in case (i) is recommended, to consider whether to appoint representatives of the Council on these All India Boards.

9. To consider the proposal of the Indian Institute of Science, Bangalore for the establishment of a Post-graduate Power Engineering Department at the Institute and to make recommendations.

10. To consider the proposal for the establishment of an Institute of Indian Architecture and Regional Planning and to make recommendations.

11 To consider the scheme for the Post-War Education and training of Engineering personnel in India prepared by Mr. C. E. Preston, Principal, Osmania Technical College, Hyderabad-Deccan and to make recommendations.

12. To consider the advisability of inviting an engineer of eminence from abroad to advise on the improvement of Engineering Education in India and to make recommendations.

13. To consider the advisability of providing facilities for advanced instruction in Highway Engineering.

14. To consider the Percy Committee Report on Higher Technological Education in England and Wales and to make recommendations.

15. To consider the article on a proposed Administrative Staff College in England by Sir Hector Hotherington, Vice Chancellor of the Glasgow University.

16. To consider the desirability of appointing a Committee to expedite the recognition of degrees in engineering given by the Indian Universities by the professional engineering institutions in the United Kingdom.

17. Any other business.

APPENDIX 2.

Department of Education.

Resolution.

New Delhi, the 30th November 1945.

Establishment of an All-India Council for Technical Education.

No. F.16-10|44-E.III.—In their plan for Post-War Development in India the Central Advisory Board of Education have given reasons for their belief that technical education at the higher stages cannot in modern conditions be effectively organised on a provincial basis. They have emphasised the need for planning this particular branch of education on an All India basis if there is to be substantial industrial development in the post-war period and have remarked that "to stimulate, co-ordinate and control the provision of the educational facilities, which such a development as well as existing industry will need, there must be an all-India body in supreme charge". They have accordingly recommended the establishment of a National Council for Technical Education which, they suggest, should control policy in technical education generally and deal with all technical institutions above the high school stage except the Technological Departments of Universities. It is obvious that this recommendation raises issues, agreement on which is likely to be reached only after considerable discussion with the various authorities concerned. At the same time the development of technical or practical instruction at all stages is important not only in view of the accepted need for making Indian education generally more realistic but also because it has an essential and urgent contribution to make towards other branches of post-war reconstruction which will demand a large increase in the available supply of Indian technologists and technicians. A necessary preliminary to any planned and balanced development of technical education is a survey by a single competent body of existing facilities, probable post-war requirements and present and prospective proposals for development in this important sphere of education. For the immediate task of survey and advice it is not necessary that an All India Council for Technical Education should be endowed with executive, administrative or controlling powers of any kind or that its establishment should be delayed until all the issues raised by the Central Advisory Board's recommendations have been settled. It has

accordingly been decided that the All India Council for Technical Education should be set up immediately, composed in the way suggested by the Central Advisory Board, but entrusted in the first instance with advisory functions only. It will be understood that the decision to set up the Council immediately with advisory functions is without prejudice and at the same time without commitment to the full implementation at a later date of the proposals in this behalf of the Central Advisory Board.

2. *Functions.*—The immediate task of the Council for Technical Education will be to survey the needs of the country as a whole for higher technical education, with special reference to prospective post-war needs, and to advise in what areas technical institutions should be established, for what branches of technology each should provide and up to what standards they should operate. In particular it will be empowered :—

(a) to survey the whole field of technical education in consultation with Provincial Governments and such Indian States as may be willing to co-operate with it ;

(b) to consider such immediate projects as are already under consideration by various departments of the Government of India, e.g., the provision of senior All India Polytechnics on the lines of the Massachusetts Institute of Technology or the establishment of a Technical College for Electrical (Power) Engineering, and to assign to these their appropriate place in all All India scheme ; and

(c) to conduct preliminary investigations with a view to ascertaining the conditions on which the authorities in control of existing technical institutes would be prepared to co-operate in an All India scheme.

3. *Constitution.*—The Central Advisory Board have envisaged the establishment of a Council representative of all the main interests concerned with technical education. Acceptance of this view precludes the setting up of a small and compact body. Technical education has many facets and the representation of the interests best qualified to assist the attainment of the objects in view can be achieved only at the expense of enlarging the size of the Council. It will be open to the Council to appoint such executive committees or other subordinate bodies as may be required to facilitate the discharge of its business. The Council will be composed as under :—

(i) *Members*—(a) Chairman, who will be an eminent person connected with industry or Commerce, will be selected by the Government of India. On occasions when he is unable to preside over a meeting of the Council the Educational Adviser to the Government of India will deputise for him.

(b) Educational Adviser to the Government of India.

(c) Representatives of the Departments of the Government of India.

(d) One member of the Council of State elected by the Council of State.

(e) Two members of the Legislative Assembly elected by the Legislative Assembly.

(f) One representative of each Provincial Government.

(g) Five representatives of Indian States to be nominated by the Governor General in consultation with the Crown Representative.

(h) Fourteen representatives of Industry, Commerce and Labour to be nominated by the following institutions :—

Associated Chambers of Commerce ;
All India Organisation of Industrial Employers ;
Federation of Indian Chambers of Commerce ;
Federation of Muslim Chambers of Commerce and Industry, Delhi ;
Employer's Federation of India ;

All India Trade Union Congress ;

Indian Federation of Labour ; and

All India Railwaymen's Federation.

(i) Two members of the Central Advisory Board of Education in India.

(j) Two members of the Inter-University Board, India, to be nominated by the Inter-University Board of India.

(k) Two representatives of the Association of the Principals of Technical Institutions in India.

(l) One representative of the Institution of Engineers, India.

(m) Two nominees of the Government of India to represent any other interests which they may consider desirable.

(ii) *Tenure of office.*—The tenure of office of the non-official members including the Chairman will be three years : provided that a member elected or nominated under sub-clauses (d), (e), (i) or (j) above shall cease to be a member of the Council if he ceases to be a member of the Council of State, Legislative Assembly, Central Advisory Board of Education or Inter-University Board of India, as the case may be. The official members of the Council will continue until they are replaced by others. All casual vacancies among the members (other than ex-officio members) shall be filled by the authority or body who nominated or elected the member whose place becomes vacant, and the person appointed to a casual vacancy shall be a member of the Council for the residue of the term for which the person whose place he fills would have been a member.

4. The All-India Council for Technical Education will be attached to the Department of Education. A member of the staff of that Department will be the Secretary of the Council. It will be the function of the Educational Adviser to the Government of India assisted by the Secretary of the Council to prepare the agenda for its meetings and attend to all work relating to the Council.

5. The names of members of the Council under para 3(i) above will be announced in due course.

DEPARTMENT OF EDUCATION.

RESOLUTION.

New Delhi, the 21st February 1946.

No. F. 16-26(7)|45-E.III.—To provide for the better representation of the Central Legislature on the All India Council for Technical Education, the following amendments are made in the Resolution No. F.16-10|44-E.III, dated the 30th November, 1945.

In the said Resolution :—

(1) for the words "One member" in paragraph 3(i) (d), the words "Two Members" shall be substituted.

(2) for the word "Two" in paragraph 3(i) (e), the word "Five" shall be substituted.

The Department of Education Resolution No. F.16-10|44-E.III, dated the 30th November, 1945 has been further amended by Resolution No. F.1-2|46-E.III, dated the 30th May 1946 to include :—

(a) One additional representative of the Institution of Engineers (India) ;

(b) One representative of the Indian Institute of Architects, Bombay ; and

(c) two representatives of the National Planning Committee.

APPENDIX 3.

All-India Council for Technical Education.

List of Members.

Chairman	1. Mr. N. R. Sarker, 'Ranjani', 237, Lower Circular Road, Calcutta.
Educational Adviser to the Government of India.	2. Sir John Sargent, C.I.E., M.A., D. Litt., Educational Adviser to the Government of India, Department of Education, New Delhi.
DEPARTMENTS OF THE GOVERNMENT OF INDIA.	REPRESENTATIVES.
Department of Agriculture ..	3. Professor J. N. Mukerjee, Director, Imperial Agricultural Research Institute, New Delhi.
Commerce Department ..	4. Mr. R. K. Nehru, I.C.S., Joint Secretary, Commerce Department, New Delhi.
Council of Scientific and Industrial Research.	5. Dr. Sir S. S. Bhatnagar, O.B.E., D.Sc., F.R.S., Director of Scientific and Industrial Research, New Delhi.
Finance Department	6. Mr. J. B. Shearer, O.B.E., I.C.S., Joint Secretary, Finance Department, New Delhi.
Department of Health ..	7. Mr. S. H. Y. Oulsnam C.I.E., M.C., I.C.S., Secretary, Department of Health, New Delhi.
Department of Industries and Supplies.	8. Mr. J. M. Shrinagesh, I.C.S., Joint Secretary, Industries and Supplies Department, New Delhi.
Labour Department ..	9. Mr. S. Lall, C.I.E., I.C.S., Secretary, Labour Department, New Delhi.
Department of Planning and development.	10. Mr. T. M. S. Mani, O.B.E., I.C.S., Deputy Secretary, Department of Planning and Development, New Delhi.
Posts and Air Department ..	11. Sir Fredrick Tymms, C.I.E., M.C., Director General of Civil Aviation in India, Posts and Air Department, New Delhi.
Railway Department (Railway Board).	12. Mr. W. G. W. Reid, Director, Mechanical Engineering, Railway Department (Railway Board), New Delhi.
War Department	13. Deputy Director Military Training (Technical), War Department, New Delhi.
Department of Works, Mines and Power.	14. Mr. D. L. Mazumdar, I.C.S., Joint Secretary, Department of Works, Mines and Power, New Delhi.
War Transport Department ..	15. Consulting Engineer to the Govt. of India (Roads), War Transport Department, New Delhi.
COUNCIL OF STATE.	16. The Honourable Rai Bahadur S. K. Das, 109, Walter Road, Dacca (Bengal).
	17. The Honourable Khan Bahadur Keramat Ali, "Jorhat", Assam.

LEGISLATIVE ASSEMBLY.

18. Pandit Govind Malaviya, Post Box No. 6., Benares.

19. Miss Maniben Kara, 7, Hughes Road, Bombay 26.

20. Mr. Muhammad Ismail Khan, Barisal (Bengal).

21. Sri S. T. Adityan. "Srivaikuntam". District Tinnevelly (South India).

22. Sardar Narayanrao Genpatrao Vinchoorkar, Nasik, (G.I.P. Rly.).

PROVINCIAL GOVERNMENTS.

Government of Madras ..	23. Joint Director of Industries and Commerce, Madras.
Government of Bombay ..	24. Mr. R. P. Patwardhan, Director of Public Instruction, Bombay Province, Poona.
Government of Bengal ..	25. The Hon'ble Minister for Education, Bengal or his nominee.
Government of Bihar ..	26. The Director of Industries, Bihar.
Government of Assam. ..	27. The Hon'ble Minister for Industries, Assam. or, The Director of Industries, Assam.
Government of Orissa ..	28. Sri Bijayanand Patnaik, M.L.A., Cuttack.
Government of Sind. ..	29. The Hon'ble Minister for Education, Sind or his nominee.
Government of the Punjab ..	30. The Hon'ble Minister for Education, Punjab or his nominee.
Government of the Central Provinces.	31. The Hon'ble Minister for Industries, United Provinces (Dr. K. N. Katju, M.A., LL.D. or his representative).
Government of the Central Provinces.	32. Dr. V. S. Jha, Officer on Special Duty, Post-War Reconstruction, Education Department, the Central Provinces.
Government of the N.W.F.P..	33. Mr. A. W. Johnstone, B.Sc., A.M.I.E.E., A.M.I. Mech. E., Director of Industries, North West Frontier Province.

INDIAN STATES.

Hyderabad-Deccan	34. Syed Ali Akbar, M.A. (Cantab), Director of Public Instruction, H.E.H. the Nizam's Government.
Mysore	35. Mr. J. Appaji Gowda, B.A. (Hons.), Commissioner for Economic Development and Planning, Mysore Government.
(Central India States) Holkar Government.	36. Captain H. C. Dhandha, Commerce Minister, Holkar Government.

(States of Western India) Gujrat and Baroda.	37. Mr. R. G. Allan, M.A., C.I.E., Member for Post-War Reconstruction, Baroda Government.
(The Madras states) Travancore and Cochin.	38. Major D. L. Deshpande, B.Sc. (Hons.) M.Sc. (Engg.) M.I.E., A.M.I. Mech. E., Principal, Engineering College, Trivandrum.

INDUSTRY, COMMERCE AND LABOUR.

Associated Chambers of Commerce of India, Calcutta.	39. Mr. A. S. Trollip, C.I.E., Manager, Bombay Electric Supply & Tramways Co. Ltd., Bombay.
	40. Mr. W. F. Scott Kerr, Messrs. George Henderson and Co. Ltd, Calcutta.
All-India Organisation of Industrial Employers, Bombay.	41. Mr. M. A. Master, General Manager, Scindia Steam Navigation Co. Ltd., Scindia House, Ballard Estate, Bombay.
	42. Dr. K. A. Hamied, C|o C.I.P.L.A. Manufacturers of Chemical and Pharmaceutical Products, 289, Belassis Road, Byculla, Bombay.
Federation of Indian Chambers of Commerce and Industry, New Delhi.	43. Mr. K. D. Jalan, Senior Vice-President, Indian Chambers of Commerce, 102-A, Clive Street, Calcutta.
	44. Sir Shri Ram, 22, Curzon Road, New Delhi.
Federation of Muslim Chambers of Commerce and Industry Delhi.	45. Dr. A. Waheed, Ph.D., Feroze Sons, Ltd., 7, Court Street, Lahore.
The Employers Federation of India, Bombay.	46. Mr. G. V. Apte, Superintendent of Training, The Tata Iron and Steel Company Limited, Jamshedpur (via Tatanagar).
	47. Sir Frederick Stones, O.B.E., Messrs. E.D. Sassoon and Co. Ltd., E.D., Sassoon Building, Ballard Estate, Bombay.
The All-India Trade Union Congress.	48. Mr. Chakkrai Chettiar, c|o Madras Provincial Committee of All-India Trade Union Congress, 157, Sharaf Ali House, Broadway, Madras.
	49. Mr. Indrajit Gupta, C|o Communist Party Office, 121, Lower Circular Road, Calcutta.
The Indian Federation of Labour, Delhi.	50. Professor B. N. Bannerji, 17, Cornwallis Street, Calcutta.
	51. Mr. M.A. Khan, 14, Brandreth Road, Lahore.
All-India Railwaymen's Federation.	52. Mr. S. Guruswami, General Secretary of the All-India Railwaymen's Federation, Mylapore, Madras.

CENTRAL ADVISORY BOARD OF EDUCATION.

	53. Sardar Bahadur Sardar Ujjal Singh, 94, Upper Mall, Lahore.
	54. Mr. S. M. Azam, Education Member, H. E. H. the Nizam's Government, Hyderabad-Dn.

INTER UNIVERSITY BOARD, INDIA.

55. Sir A. L. Mudaliar, B.A., M.D., D.Sc., F.R.C.O.G., F.A.C.S., Vice-Chancellor of Madras University.

56. Professor N. K. Sidhanta, Dean of the Faculty of Arts, University of Lucknow.

ASSOCIATION OF PRINCIPALS OF TECHNICAL INSTITUTIONS (India).

57. Mr. W. W. Wood, F.R.I.B.A., M.I. Struct., E., E.I.I.A., M.I.E. (Ind.), Messrs. W. W. Wood, Sons and Partners, 9, Court Road, Delhi.

58. Mr. P. N. Joshi, M.Sc. Tech., Principal, Victoria Jubilee Technical Institute, Bombay.

THE INSTITUTION OF ENGINEERS (India).

59. Mr. N. V. Modak, C.I.E., J.P., B.E., M. Inst. C.E., M.I.E. (India) F. R. San, I., 'Udyan' Near Sivaji Park, Bombay 28.

NOMINATED BY THE GOVERNMENT OF INDIA.

60. Mr. Fazal Ibrahim Rahimtoola, C.I.E., B.A., Ismail Buildings, Hornby Road, Bombay.

61. Mr. G. L. Mehta, "Wellesley House", 7, Wellesley Place, Calcutta.

Secretary,

Dr. S. R. Sen Gupta, B.Sc., (Glas.), Ph.D. (Glas.), Deputy Educational Adviser to the Govt. of India, Department of Education.

APPENDIX 4.

All India Council for Technical Education.

Memorandum.

Administration of Technical Education.

At an inter-departmental meeting held on the 5th October, 1944 the following agreement was arrived at between the Departments of Education and Labour of the Government of India in regard to their respective functions in the field of technical instruction and training so far as the Central Government is concerned :—

"Though it is difficult to draw a hard and fast line between 'Technical Education' and 'Technical training', it is necessary to make such a distinction and entrust technical education with the Education Department and 'training' with Labour Department. Training here signifies special training or 'conditioning' of the products of educational institutions and others with a view to placing them in trade and industries. With the development of technical Education the need for technical training will diminish. The products of the technical schools should be able to pass more easily from these schools into industry. But so far as any training or 'conditioning' is necessary for initial placing in the industries of the product of technical schools or for transfer of Labour from one Employment to another, such training or "conditioning" should be the responsibility of the Labour Department, which is directly concerned with all aspects of the question of industrial employment.

2. The Labour Department will continue to run, 'the technical training centres' and other similar institutions which provide the training necessary to meet the requirements of civil industry. In consultation with its Standing Advisory Committee, it will make such adjustments in its training scheme as may be considered necessary. The Education Department will be concerned with strengthening and developing technical and technological colleges and establishing wherever possible 'technical High Schools' and 'Junior Technical Schools' on the lines suggested in the Central Advisory Board of Education Report on its being approved by the Government of India.

3. Steps should be taken immediately to establish the National Council of Technical Education as recommended in the Report of the Central Advisory Board of Education. As the Council itself will be a very large body it may not be possible for it to have more than two meetings in a year. Its day to day business should be conducted by Committees set up for specific purposes.

4. In order to secure immediate co-ordination in Government's policy in regard to Technical education and technical training, it is desirable to set up a Committee consisting of representatives of *Education, Health and Lands, Labour and †Industries and Civil Supplies Departments to review all schemes or proposa's dealing with Technical Education and Training and also all proposals for sending students and others for further training abroad in technical subjects.

5. The administration of all technical education should be under the Education Department of the Central, Provincial or State Government, as the case may be. There should be a separate inspectorial staff for this purpose. There should be close contact between Departments of the Central Government concerned with Technical Education and Provincial Governments through the National Council of Technical Education."

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*Now trifurcated into the Departments of Education, Health and Agriculture.

†Now amalgamated with the late Department of Supply, and known as the Department of Industries and Supplies.

6. The following is the revised classification of the subjects. The Departments responsible for training in graduate and post-graduate courses are indicated below :—

Department of Education.

(i) Teachers.

(ii) Scientists and Industrial Chemists.

(iii) Economists and Statisticians (in consultation with the Economic Adviser).

(iv) Engineers—Civil, Mechanical, Electrical, Chemical, Electro-Chemical, Telephone, Telegraph and Signal engineering. (Except in the case of Departments which maintain specialised institutions of their own, or which desire post-graduate training for their own staff).

(v) Geologists.

Labour Department.

(i) Labour Welfare Personnel.

(ii) Architects.

(iii) Mining Engineers and other Mining experts.

(iv) Industrial executives and managers.

Department of Agriculture.

(i) Agricultural personnel of all kinds, Entomologists, soil Chemists, Agricultural Engineers, etc.

(ii) Animal Husbandry and Dairy experts.

(iii) Veterinary personnel.

(iv) Forestry personnel.

(v) Anti-erosion staff.

(vi) Botanists and fishery experts.

Department of Health.

(i) Doctors and Nurses.

Post and Air Department.

(i) Meteorologists.

War Department.

(i) Training Institutions for the Defence Services.

Commerce Department.

(i) Mercantile Marine.

LIST OF PUBLICATIONS OF THE BUREAU OF EDUCATION IN INDIA

Serial No.	Name of Publications.	Year of Publication.
1	Report on Vocational Education in India (Delhi, the Punjab and the United Provinces) (E.H.L.—34)	1937
*2	Report of the Women's Education Committee on Primary Education of Girls in India—1936	1937
*3	Report of the Women's Education Committee of Central Advisory Board of Education to consider curriculum of Girls' Primary Schools in India	1937
*4	Report of the Vernacular Education Committee of the Central Advisory Board of Education appointed to consider certain questions connected with the administration and control of primary education	1937
5	Report of the First Committee of Central Advisory Board of Education appointed to consider the Wardha Education Scheme (EHL—40) ..	1938
6	Report of the 2nd Wardha Education Committee of the Central Advisory Board of Education (App. IV to 5th meeting proceedings)	1940
7	Report of the Adult Education Committee of the Central Advisory Board of Education, 1939. (EHL—46) (App. III to 5th Meeting Proceedings)	1940
8	Report of the Social Service and Public Administration Committee of the Central Advisory Board of Education in India, 1940, together with the decisions of the Board thereon. (EC.—6)	1941
@9	Report of the Joint Committee appointed by the Central Advisory Board of Health and Central Advisory Board of Education on the Medical Inspection of School Children	1941
10	Report of the Scientific Terminology Committee of the Central Advisory Board of Education in India, 1940, together with the decisions of the Board thereon. (E.C.—5)	1941
11	Proceedings of the 6th Meeting of the Central Advisory Board of Education held at Madras on 11th and 12th January, 1941. (E.C.4 VI) ..	1941
12	Proceedings of the 7th Meeting of the Central Advisory Board of Education in India held at Hyderabad, Deccan, on 14th and 15th January, 1942. (EC 4 VII)	1942
13	Report of the School Building Committee. (E.C. 8)	1942
14	Report of the Uniform Braille Code Committee. (E.C. 7)	1942
15	Report of the Examination Committee, 1942. (E.C. 12)	1942
16	Report of the Expert Committee on a Uniform Braille Code for India with the Braille charts printed in India Alphabets 1942	1942
17	Proceedings of the 8th Meeting of the Central Advisory Board of Education held at Lucknow (E.C. 4 VIII)	1943
18	Report of the Joint Committee of the Central Advisory Board of Education and the Inter-University Board appointed to investigate the questio nof the relation of the School Leaving Certificate Examination to the Matriculation Examination, 1942. (E.C. 9)	1943
19	Report of the Committee of the Central Advisory Board of Education on the Training, Recruitment and Conditions of Service of Teachers. (E.C. 10)	1943
20	Report of the Committee of the Central Advisory Board of Education appointed to consider the Question of the Recruitment of the Education Officer, 1942 together with the decisions of the Board thereon. (E.C. 11)	1943
	Report of the Examination Committee	1943
	Proceedings of the 9th and 10th Meetings of the Central Advisory Board of Education in India held in October 1943 and January 1944 respectively E.C. 4 IX & X	1944

LIST OF PUBLICATIONS OF THE BUREAU OF EDUCATION IN INDIA—*contd.*

Serial No.	Name of Publications.	Year of Publication.
23	Report of the Technical Education Committee 1943. (E.C. 16) ..	
24	Report of the Text Book Committee, 1943. (E.C. 15)	
25	Report of the Examination Committee (Technique of Examinations), 1943. (E.C. 17)	1944
26	Report of the Committee of Central Advisory Board of Education appointed to consider the question of Training, Recruitment and condition of service in Universities, etc., together with the decisions of the Board thereon. (E.C. 22)	1945
27	Report of the Central Advisory Board of Education on Post-War Educational Development in India, 1944. (E.C. 13)	1945.
28	Volume containing reports of the Committees of Central Advisory Board of Education. (E.C. 14)	1945
29	Report of the Administration Committee of Central Advisory Board of Education	1945
30	Proceedings of the 11th Meeting of the Central Advisory Board of Education. (E.C. 4, XI)	1945
31	Report of the Agricultural Education Committee of the Central Advisory Board of Education, 1944. (E.C. 20)	1945
32	Proceedings of the 12th Meeting of the Central Advisory Board of Education held at Mysore in January 1946	1946
33	Report of the Religious Education Committee of the Central Advisory Board of Education	1946
34	Development of Higher Technical Institutions in India (Interim Report of Sarker's Committee)	1946
35	Report of the Committee of the Central Advisory Board of Education on Selection of Pupils for Higher Education.	1946
36	Report of the Central Advisory Board of Education on Conditions of Service of Teachers	1946
37	Reports of the Committees of the C.A.B. of Education (1943-46).	
38	Proceedings of the 1st Meeting of the All India Council for Technical Education held at New Delhi on the 30th April, 1st and 2nd May, 1946.	

* Not published previously, but proposed to be included in future reprints.

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10 MAR 1948

BUREAU OF EDUCATION, INDIA

SCIENTIFIC MAN-POWER COMMITTEE

INTERIM REPORT

Programme for the Immediate Improvement and Expansion of Facilities for Scientific and Technical Education, Research & Training.

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PERSONNEL AND TERMS OF REFERENCE

The Scientific Man-power Committee was set up by the Government of India in April 1947 under the Chairmanship of the late Sir Shafaat Ahmed Khan as notified in a press communiqué issued on April 19, 1947. The present composition of the Committee is as shown below:

Sir Shanti Swarup Bhatnagar, F.R.S.,
Director, Council of Scientific
and Industrial Research, Delhi. (Chairman).

Dr. Homi Bhabha, F.R.S.,
Director, Tata Institute of Fundamental Research,
Peddar Road, Bombay.

Dr. K. A. Hamed,
c/o CIPLA, Manufacturers of Chemical & Pharmaceutical Products,
289, Belassis Road, Byculla, Bombay.

Mian Afzal Husain,
Member, Punjab & N. W. F. P., Joint Public Service Commission,
Lahore.

Prof. Humayun Kabir,
Member, Railway Enquiry Committee,
Railway Board, New Delhi.

Rai Bahadur A. N. Khosla, I.S.E.,
Chairman, Central Waterways, Irrigation and Navigation Commission,
New Delhi.

Sir K. S. Krishnan, F.R.S.,
Director, National Physical Laboratories,
University Buildings, Delhi.

Mr. G. L. Mehta,
7, Wellesley Place, Calcutta.

Mrs. Hansa Mehta,
16, Altamont Road, Camballa Hill, Bombay.

Major B. N. Mitra,
Defence Department, New Delhi.

Professor J. N. Mukherji,
Director, Indian Agricultural Research Institute, Delhi.

Dr. M. Qureshi,
Director, Board of Scientific & Industrial Research, Hyderabad
(Deccan).

Rao Bahadur Dr. K. C. K. E. Raja,
Officer on Special Duty, Ministry of Health, New Delhi.

Dr. Birbal Sahni, F.R.S.,
Professor of Botany & Dean of the Faculty of Science,
Lucknow University, Lucknow.

Wing Commander H. Singh,
Technical Branch, Air Headquarters, New Delhi.

Mr. D. N. Wadia,
Mineral Adviser to the Government of India,
Ministry of Works, Mines and Power, New Delhi.

Dr. S. R. Sen Gupta,
Deputy Educational Adviser (Technical),
Ministry of Education, New Delhi (Secretary).

The following are the terms of reference of the Committee:—

(1) To assess the requirements for different grades of scientific and technical manpower, taking a comprehensive view over a period of the next ten years, of the needs of Government (Civil and Defence), of teaching and research and of industry, agriculture, transport, medicine and other fields dependent on the use of scientific and technical manpower;

(2) To make recommendations regarding action to be taken during the next five years to meet these requirements, in particular with reference to:—

(a) the immediate improvement and expansion of facilities for scientific and technical training in Indian universities and special institutions,

(b) training overseas in scientific and technical subjects;

(c) the promotion and development of scientific and technical research,

(d) the utilisation of scientific and technical manpower, and

(e) the maintenance of a register of scientific and technical personnel to facilitate their utilisation to the best advantage.

At its third meeting held on the 22nd and 23rd August, 1947, the Scientific Man-power Committee adopted the following report prepared by its sub-committee adumbrating measures for the immediate improvement and expansion of facilities for scientific and technical education, research and training.

S. R. SEN GUPTA,
Secretary.
Scientific Man-Power Committee.

REPORT OF THE SUB-COMMITTEE OF THE SCIENTIFIC MAN-POWER COMMITTEE

INTRODUCTION

At its explanatory meeting held on the 12th and 13th May 1947, the Scientific Man-power Committee came to the conclusion that the available data on which to base the Committee's work were inadequate and that a considerable amount of information, both qualitative and quantitative, required to be collected before the Committee could begin its work. They thought that the collection, sifting and collection of such data could be made speedily only if the Government placed at the disposal of the Committee 15 officers on special duty. The Government have been good enough to sanction ten posts but owing to certain administrative difficulties, arising mainly out of the present constitutional changes, it has not been possible to fill these posts, excepting one and that also only a few days back. Meanwhile, the health of the Chairman, the late Sir Shafaat Ahmed Khan, had deteriorated greatly and at his request, Sir Shanti Swarup Bhatnagar consented to act as the Chairman of the Committee.

Sir Shanti Swarup Bhatnagar has since been appointed Chairman in place of the late Sir Shafaat Ahmed Khan with effect from the 23rd July 1947.

On the 7th July, 1947, the acting Chairman was requested by the Government to let them have by the 5th of August, at the latest, an 'Interim Report' based on available information, however inadequate, recommending measures which should be given the highest priority and initiated within six months in order to meet, to some extent at least, the shortage of scientific and technical personnel—a shortage which is admitted on all hands.

In view of the urgency of the situation, Sir Shanti Swarup Bhatnagar agreed to undertake this work. A Sub-Committee consisting mainly of the local members of the Main Committee was constituted at the instance of the Government. The purpose of the Sub-Committee was to formulate certain interim recommendations, prompt action on which on the part of the Government could pave the way to meeting partially the scientific and technical manpower shortage. The Sub-Committee consisted of:—

Sir S. S. Bhatnagar, F.R.S. (Chairman).
Rai Bahadur A. N. Khosla.
Dr. J. N. Mukherjee.
Rao Bahadur Dr. K. C. K. E. Raja.
Dr. J. N. Ray.
Wing Comdr. H. Singh.
Mr. D. N. Wadia.
Dr. S. R. Sen Gupta. (Secretary).

and had before it the following terms of reference:—

To advise the Government of India on measures which should be given the highest priority and initiative within the next six months in respect of—

(a) the immediate improvement and expansion of facilities for scientific and technical training in Indian universities and in special institutions; and

(b) the promotion and development of scientific and technical research.

The Sub-Committee held its first meeting on the 16th July, 1947, and came to the conclusion that the best method of tackling the task before it would be for each member of the Committee to prepare a note on the subject or subjects with which he was concerned, suggesting what programme of training could be initiated within the next six months, taking due note of the existing facilities for education, training and research, with a view to improving and developing them and using them to their fullest extent. Thereafter, the Sub-Committee as a whole could consider the facts thus presented and formulate

recommendations. The members accordingly prepared the following notes, which are given in Part II of the Report:—

Sir S. S. Bhatnagar—Training of personnel for scientific and industrial research and for industry.

Rai Bahadur A. N. Khosla—Programme for provision of facilities for education, training and research for engineering personnel which can be initiated within the next six months.

Dr. J. N. Mukherjee—Measures which can be implemented in the next six months for speeding up education, training and research in agriculture and allied subjects.

Rao Bahadur Dr. K. C. K. E. Raja—Training of health personnel.

Dr. J. N. Ray—Requirements of technical and scientific personnel for industrial development and their training programme.

Wing Comdr. H. Singh—R. I. A. F. training, research and development in collaboration with civil institutions.

Mr. D. N. Wadia—Programme for provision of facilities for education, training and research in Geology and Mining which can be initiated within the next six months.

Dr. S. R. Sen Gupta—Programme for the improvement and development of higher technical education.

These notes were considered by the Sub-Committee on July 25, 26, 28 and August 3, 1947, and the Sub-Committee's findings and recommendations are given in Chapter I. A brief summary of the Sub-Committee's recommendations is given in Chapter II.

CHAPTER I

PROGRAMME FOR THE IMMEDIATE IMPROVEMENT AND EXPANSION OF FACILITIES FOR SCIENTIFIC AND TECHNICAL EDUCATION, RESEARCH AND TRAINING.

1. In order to maintain the closest possible relation between the terms of reference before us and our findings and recommendations, we have found it convenient to report under distinct main headings, *viz.*, Education, Research and Industrial Training. It should, however, be mentioned that the subjects are so interlinked and have such close bearing on each other that any hard and fast demarcation can neither be made nor is desirable. We also mention that owing to the limited amount of information available to us as well as our cognisance of the present scarcity of capital goods, building materials, etc. we have exercised considerable caution and restraint in formulating our recommendations.

SECTION I—EDUCATION

2. Although we did not have up-to-date statistics concerning the annual output of scientific and technical personnel from institutions, we had before us a certain amount of information, which is necessarily slightly out-of-date. We reproduce below the figures concerning the whole of British India for the year 1940.

Students passing the various examinations

Matriculation or its equivalent	92,552
Intermediate Arts	19,000
Intermediate Science	5,453
B.Sc. (Pass)	2,199
B.Sc. (Honours School)	359
M.Sc.	428
Medical Degree	875
Agricultural Degree	293
Engineering (Civil, Mechanical & Electrical, Mining and Metallurgy) Degrees	638
Doctorate (Arts, Science, Medicine) Degrees	38

These figures reveal the inadequacy of the 1940 output. We have no reason to suppose that conditions have changed to any great extent.

3. **Basic scientific education.**—A substantial increase in the facilities for education in general science up to Intermediate Science and B.Sc. standards is clearly an immediate necessity so that the output from these courses may be adequate, in quantity as well as in quality, to feed the professional and post-graduate institutions, which it will be necessary to improve, expand and multiply to meet India's immediate and future needs for scientists, technologists, engineers and medical men.

4. **Double Shift.**—We have considered in this connection, as an interim measure, the possibility of running double shifts in Colleges. While the double shift system would certainly help us to tide over the present difficulty of providing additional teaching accommodation and perhaps additional equipment, we cannot whole-heartedly support its adoption. We are given to understand that during the war the double shift system was given a trial in some places but was not altogether a success. Teaching should have sufficient leisure not only to prepare lectures, correct home work and laboratory record books, etc. but also to keep themselves up-to-date by reading current literature and latest

text books. Although educationally unsound, we, in view of the present emergency, recommend, only as an interim measure, the introduction of double shifts in such institutions where there is a certain amount of spare equipment, provided a completely new set of staff is engaged for lecture and laboratory work in the second shift. The Government should, wherever the introduction of the double shift system is considered feasible, come to the aid of the institutions if necessary by—

(a) bearing a share of the expenses on staff salaries and contingencies, and

(b) assisting the institutions in the procurement of equipment and building materials.

5. We note with regret that not much progress has been made in the establishment of Technical High Schools. We strongly urge the Provincial Governments, etc. to convert without delay some of their existing ordinary High Schools to Technical High Schools, and to simultaneously proceed with the early establishment of new Technical High Schools. We attach considerable importance to the establishment of a large number of institutions of this type. For, the products of these institutions are likely to be better fitted to take to scientific and technical occupations. As the establishment of such schools will reduce the total schooling period as preparation for professional courses by one year, it will also lead to an increase in the available material for admission to the professional and scientific institutions.

Higher Scientific Education.—While we are pleased to note that the Central Universities, *viz.*, Aligarh, Benares and Delhi, are being developed to provide wider facilities for higher scientific education, we feel at the same time that there is need for developing also the scientific departments of other universities, especially their post-graduate departments, so that an adequate number of scientific personnel with Honours and M.Sc. qualifications may be forthcoming for teaching posts, for service as specialists, for research and training in the National Laboratories and in industry; for example, each of the proposed Higher Technical Institutions is likely to require over 600 teachers and the National Laboratories would require more than 600 men with specialised qualifications. There is also the need for a large number of scientists to provide the expanded facilities for education in universities and other institutions. We, therefore, recommend that the Central Government should come to the aid of all universities by giving them suitable financial and other assistance to expand their post-graduate departments.

7. **Geological Education.**—In particular, we strongly support the recommendations of the Geological Education Committee and urge the Government to give effect to these recommendations immediately, so that trained geologists, adequate in number, say about 80 per year, for the teaching of geology and for the survey and development of the mineral resources of India, may become available; for example, the Geological Survey of India alone will require within the next two or three years 150 geologists.

8. In regard to the training of geologists, there is one special aspect which cannot be passed over. The education of a working geologist is different from that of any other scientist. A systematic field training forms an essential part of a geologist's education. This kind of instruction could hardly be provided by universities and colleges. We understand that the Geological Survey of India will soon have adequate staff to help educational institutions by opening field training camps to supplement the education of our geology-graduates. We recommend that the Geological Survey should increase the number of their field training camps in order to train at least 50 geologists annually for field work (For details see Mr. Wadia's Note).

9. **Engineering and Technological Education.**—In view of the uncertainty of the extent of development of Indian industries during the next few years and as

a consequence of the inadequacy of information available to us, we are unable to assess with reasonable exactitude the requirements for technical personnel during the next four or five years. In the absence of other data, the only way in which an approximate assessment can be made of our immediate requirements is to analyse the new capital flotation allowed by the Government and to infer from that India's requirements for technicians. The table below gives the position of new capital issues for some of the various industries since January, 1946. In the last column is shown the number of additional technical personnel that would be required for the successful running of these industries. The technical personnel have been devided into three categories:—

'A'=Experts.
'B'=Technicians with superior qualifications.
'C'=Lower grade technicians including mechanics.

Industries	New Capital issue allowed in 1946 (in lakhs)	Estimated requirement (Number in Grades)		
		'A'	'B'	'C'
	Rs.			
1. Glass and Ceramics	213	10	30	200
2. Chemicals & Drugs	570	20	100	250
3. Soap and oil (excluding edible=oils and Vanaspati)	110	8	10	100
4. Rayon and Art silk	402	6	30	200
5. Paper, Board, etc.	281	10	50	150
6. Plastics	50	10	40	200
7. Leather	85	5	13	35
8. Cement	463	10	20	80
9. Woollen	137	10	36	100
10. Rubber	117	70	94	188
11. Engineering	1,242	25	150	1,000
12. Electrical	910	25	150	300
13. Non-Ferrous Metals	98	6	45	250
14. Machine=tools	122	100	400	1,000

10. It is worth noting that the new capital issue allowed since 1946 is about Rs. 47 crores whereas the total capital invested in organised industry up to the year 1937 has been estimated to be about Rs. 80 crores. It is, therefore, clear that since 1946 the capital issue for industry has increased by about 60%. We are informed that since the last Budget Session of the Central Legislature there has been a considerable falling off of application from industry to start new lines of manufacture and it is, therefore, not possible to foresee what would be the requirements of industry for technical personnel unless the precise industrial policy of the Central Government is definitely known. There is, however, every reason to believe that the tempo of capital investment in industry is likely to be faster in the near future provided the Government adopt a benevolent policy to foster the growth of industry.

11. The present (1946) output of graduates in engineering and technology is estimated to be as follows:—

Aeronautical Engineering	15
Architecture and Building construction	20
Civil and Municipal Engineering	467
Chemical Engineering and Chemical Technology	244
Electrical Engineering	285
Mechanical Engineering	258
Metallurgy	27
Mining	27
Total	1,343

12. From a comparative study of the figures for the present output with those for the immediate requirements of industry alone, leaving aside the requirements of Governments for their contemplated large-scale public works—we have come to the conclusion that we have to plan for at least a four-fold increase in the output of all categories of personnel, if we are to meet our needs for the next four or five years.

13. We have dealt with the question of training of 'A' grade technicians, *i.e.*, experts, in subsequent sections dealing with Research and Training. In the matters of education in engineering and technology, we, therefore, recommend a short-term and a long-term programme both of which require to be initiated within six months.

14. **Short-term programme.**—Under the short-term programme, we recommend the adoption of the following five measures:—

I. Introduction of an intensive twelve month training programme in co-operation with industry.

II. Introduction of three-year degree course in engineering.

III. Introduction of double-shift system in engineering colleges.

IV. Use of science departments of university colleges for the instruction of engineering students in science subjects.

V. Employment of experts to assist in teaching.

VI. Improvement of salaries of teachers.

15. (I) We recommend the introduction of an intensive 12-month training programme for M.Sc.'s and graduates in chemical technology to be run on co-operative basis, between different universities and relevant industries. We feel that some of the existing institutions, if assisted with suitable grants, capital and recurring, should be able to impart short-term courses to the technological graduates, who can then be placed in appropriate factories for practical training for a further period of six months. For example, an ordinary M.Sc. graduate in applied chemistry can be trained in educational institutions in such subjects as oils and fats, paints and varnishes, etc., for a short period, say six months, to supplement his basic scientific training. This training programme can be shared by two or three institutions depending on the subject and the specialisation required; this academic training to be followed by practical training in a suitable factory for a period of six months or so. We consider that the following institutions are capable of organising such courses and recommend the grants noted against each:—

	Capital grant (in Rs. lakhs)	Recurring grant (in Rs. lakhs)
(1) Harcourt Butler Technological Institute, Cawnpore	5	1
(2) College of Technology, Hindu University, Benares	5	2
(3) Department of Applied Chemistry, Calcutta University	7	2
(4) Laxminarayan Technological Institute, Nagpur	3	0·8
(5) University College, Andhra University	3	0·5
(6) Indian Institute of Science, Bangalore	..	2
(7) Bengal Tanning Institute, Calcutta	1	0·5
(8) Institute of Leather Technology, Madras	1	0·5
(9) Engineering College, Guindy, Madras	2	0·75
(10) Department of Engineering and Technology, Annamalai University	1	0·5
(11) Department of Chemical Technology, Bombay University	1	0·5

	Central grant (in Rs. lakhs)	Recurring grant (in Rs. lakhs)
(12) Forest Research Institute, Dehra Dun . .	2	0.75
(13) College of Engineering and Technology, Jadavpur	2	1
(14) Victoria Jubilee Technical Institute, Bombay .	1	0.5
Total .	34	13·3

This recommendation on being given effect to will help to a great extent in making good the present shortage of chemical technologists of grade B.

16. (II) At present, the courses in engineering extend over a period varying from three to four years. We have every reason to presume that with judicious selection for admission to engineering colleges, it should be possible to reduce the period of training to three years. We understand that the All-India Council for Technical Education have prepared a draft curriculum and syllabuses of studies which it should be possible to cover in three academic sessions of 1400 hours each as against the commonly prevailing four academic sessions of less than 1000 hours each. We, therefore, recommend that the universities should consider the introduction of three-year-degree courses in engineering. This would shorten the training period, and also largely help in the increase of the number of engineers.

17. (III) We have also considered the feasibility of introduction of double shifts in some of the colleges. We are given to understand that it was run with some success in the Thomason Engineering College, Roorkee during the war years. Elsewhere, in paragraph 4, we have stated the reasons for our reluctance to recommend the general introduction of double shift system. With the provisos stipulated therein we recommend that the universities may consider the introduction of double shift system, if conditions permit.

18. (IV) Wherever possible use should be made of the teaching facilities of the science departments of suitable colleges to assist in the education in basic sciences for engineering students.

19. (V) As an interim measure we recommend that engineers in Government service should be encouraged, where necessary, to assist in the instruction in engineering colleges. This would relieve the strain on college professors and will save them some of their time for training additional students, who too will derive more benefit from the latest ideas and knowledge and appreciation of the latest developments in the various engineering activities.

20. (VI) We understand that there is an acute shortage of teachers in most of the engineering colleges and this is mainly due to the inadequate salaries offered for teaching posts. We are definitely of the opinion that the pay and prospects of a teacher should correspond to those that would be open to him had he joined a technical department under the Government.

21. **Long-term programme.**—As long-term measures which have to be initiated right now if they are to bear fruit within the next four or five years, we recommend the following:—

I. Establishment of Regional Committees of the All-India Council for Technical Education.

II. Improvement and expansion of the existing colleges of engineering and technology.

III. Expansion of the Delhi Polytechnic, especially its departments of Architecture and Engineering.

IV. Equipping of all institutions of engineering and technology, adequately.

V. Arranging for the early operation of the Power Engineering Department of the Indian Institute of Science.

VI. Expediting the establishment of the Regional (Eastern & Western) Higher Technical Institutions.

VII. Expansion of the Indian School of Mines, Dhanbad.

22. (I) We understand that in order to enable the All-India Council for Technical Education to tender judicious advice to the Government for the provision of facilities for technical education in every part of the country, adequate in relation to the possible industrial development of each region, the Council have decided to establish regional committees and that the formation of these committees has been delayed owing to the present constitutional changes. We strongly recommend that for ensuring co-ordinated development of technical education and generally to raise its standard, it is essential to establish the regional committees immediately.

23. (II) For the improvement of the standard of education as well as the expansion of some of the institutions of engineering and technology, so that the present facilities may be utilised to the fullest extent, the Government of India should immediately make grants to such institutions as are recommended by the All-India Council for Technical Education. We understand that the All-India Council for Technical Education will shortly submit specific recommendations for the improvement and expansion of the following institutions on the basis of reports of Expert Committees set up by them for this purpose.

(i) College of Engineering and Technology, Jadavpur.

(ii) Department of Applied Chemistry, University College of Science and Technology, Calcutta.

(iii) Department of Applied Physics, University College of Science and Technology, Calcutta.

(iv) Engineering College, Benares Hindu University.

(v) College of Mining and Metallurgy, Benares Hindu University.

(vi) College of Technology, Benares Hindu University.

(vii) Engineering College, Dayalbagh.

(viii) Engineering College, Muslim University, Aligarh.

(ix) N. E. D. Engineering College, Karachi.

(x) Victoria Jubilee Technical Institute, Bombay.

(xi) Department of Chemical Technology, Forman Christian College, Lahore.

(xii) Department of Chemical Technology, Bombay University.

(xiii) Laxmi Narayan Institute of Technology, Nagpur University.

(xiv) Department of Technology, Andhra University.

(xv) Department of Chemical Technology, Madras University.

(xvi) Engineering College, Annamalai University.

With suitable financial assistance the output from these institutions can be increased by more than 50 per cent. within the next three or four years. The total capital grant required for the purpose would be in the neighbourhood of about rupees two crores spread over five years and the recurring grant about rupees 31 lakhs. We strongly recommend that adequate funds should be made available and steps initiated by October, 1947, for the improvement of these institutions. This measure would raise the standard of education in these institutions and in most cases also increase their training capacity and thereby lead to a gradual increase in the annual output of graduates.

24. (III) We understand that some building construction is contemplated for the Delhi Polytechnic to enable it to increase the annual intake to the Architecture Classes. The matter requires immediate attention as there are less than 300 qualified architects in the whole of India and facilities for architectural education are almost non-existent in the country. With the expenditure of about a lakh of rupees, the Government would be providing facilities for the education of 30 or more architects every year.

25. We should have been happier if the progress of the Delhi Polytechnic had been more satisfactory. We understand that the lack of progress has been mainly due to the utterly inadequate salaries which are being offered to the teaching posts in the Delhi Polytechnic. We consider it essential that the Government should forthwith improve the prevailing scales of pay for teachers in the Delhi Polytechnic and also take steps to shift the institution from its present premises to a more commodious site. The Government should also consider the desirability of setting up a small technical committee to advise the Governing Body on technical matters and also affiliate certain departments of the Polytechnic to the Delhi University.

26. (IV) At present most of the educational institutions are suffering from lack of equipment. We consider the matter worthy of special attention, and have dealt with it in a later section. Here, we should urge the Government to remove immediately all restrictions on the import of scientific and technological equipment and also introduce measures affording relief from import duty by allowing rebate on such imports to educational institutions.

27. (V) We note that the Indian Institute of Science is being developed further and that a High Voltage Laboratory and a Power Engineering Department for the post-graduate training in power engineering are being established. We would urge the Indian Institute of Science authorities to expedite the operation of the Power Engineering Department so that a number of engineers adequately qualified to tackle power development especially hydro-electric, may be available in the very near future.

28. (VI) We note that on the recommendation of the Sarkar Committee the Government have decided to establish within the quinquennium commencing from 1946-47, two regional institutions, namely, the Eastern and the Western Institutions, each with a capacity for the training of about 2000 under-graduates and 1000 post-graduate and research students. Each of these institutions is to have wide facilities for post-graduate study and research. For example, the Eastern Institutions is expected to provide facilities for post-graduate study and research in the following subjects:—

Fuel Technology.
Pharmaceutics and Fine Chemicals.
Regional Planning.
Paper Technology.
Glass and Ceramics.
Plastics.
Paints and Pigments.
Hydraulic and River Research.
Transportation (including Railway Engineering).
Structural Engineering (including High Dams).
Design of Electrical Machinery.
Refrigeration and Air conditioning.
Automobile Engineering.

Machine-Tools.
Design of Machinery and Instruments.
Light Alloys.
Industrial Physics.
Electronics (including Radio Engineering).
Economic Botany.
Geophysics, Geology, Mineralogy.
Meteorology.
Food Technology.

29. We strongly recommend that within the next six months the Government should complete the purchase of the sites and appoint the planning staff and, if possible, arrange to hire temporary buildings to start the institutions. We attach the greatest importance to the early establishment of these institutions, for the sooner they are established the sooner will India be free from the necessity of sending overseas a large number of scholars for advanced training in different branches of technology. We are also of the opinion that in order to expedite construction of buildings for these institutions, it would be desirable to authorise the department concerned to use private agencies instead of the Central Public Works Department.

30. (VII) We understand that a Reorganisation Committee has recommended comprehensive measures for the improvement and expansion (doubling its present output of mining engineers and applied geologists)—of the Indian School of Mines, Dhanbad. We urge that these recommendations be acted upon without delay.

31. **Education and Training of 'C' Grade Technicians.**—We cannot close this sub-section without making some reference to the matter of education and training of the 'C' grade technicians including mechanics. We understand that the Labour Department of the Government of India have under consideration a comprehensive scheme for the training and apprenticeship of craftsmen for industry. We are of the opinion that the implementation of this scheme should not be delayed any longer and that it should be initiated, wherever possible, within the next six months.

32. For this purpose and for the training of foremen and overseer type of personnel, the Government should take over some of the private engineering schools and develop them. We are not able to make any estimate of the financial implications of such a step, but we are convinced that the step recommended by us is the only possible way under the present conditions for quickly developing engineering schools for the training of overseer type of personnel and also for increasing the outturn of the number of craftsmen. Later on, in Section III dealing with "Industrial Training" we have made further suggestions.

33. Before we close this sub-section, we should also like to refer to the special needs of Footwear and Leather Industries. The available training facilities for both the superior as well as the craftsmen type of personnel are inadequate. The development and promotion of scientific and technical research in leather industries would be stimulated by introducing leather chemistry as one of the subjects for the M.Sc. Industrial Chemistry and encouraging the students qualified in leather technology to do research in leather chemistry for the doctorate degrees. We also consider that the existing training institutions should be made more efficient and useful by adding to their equipment, and by enabling them to employ better paid staff.

34. *Practical Training of Engineers.*—One aspect of engineering education deserves special attention, *viz.*, facilities for their post-collegiate practical training. We have later, under the section 'Industrial Training' also dealt with certain aspects of this question. Past experience has shown the necessity of some positive steps to ensure that fresh graduates receive an adequate amount of such training. Employers, including Indian mines, metallurgical works, oil companies as well as Government departments should appreciate that engineering colleges cannot provide them with finished products for ready employment in responsible posts and that it would be to their interest to take in fresh graduates and train them properly. Unless employers are willing to face this responsibility and readily undertake to provide facilities for the practical training of fresh graduates, it may be necessary to introduce legislation making it obligatory on the part of organised industry to do so.

35. **Education of Agricultural personnel.**—It is understood that on the whole the standard of teaching in Agricultural colleges in the country is rather indifferent. Certain suggestions, which have been put forward in Dr. Mukherjee's note (Part II, Chapter III) for the improvement of the standard of education deserve serious consideration. It is essential to ensure co-ordinated development of agricultural education, for which purpose the Government should consider the desirability of establishing an Advisory Council for Agricultural Education on an All-India basis. This is specially necessary in view of the large number of agricultural personnel that would be required. For example, according to the findings of the Agricultural Education Committee of the Central Advisory Board of Education, the Agriculture Departments alone would require during the next 10 or 15 years:—

300 Gazetted Officers.
15.000 Graduate Assistants.
30,000 Non-gazetted field assistants for agricultural work, and 550 Gazetted Officers.
4,000 Non-gazetted Inspectors, and 20,000 Stock-men for animal-husbandry work.

36. Considering the output figures for the year 1940, *i.e.*, about 293 graduates and 290 licentiates, it is apparent that steps must be initiated without delay to implement all schemes for large scale expansion of facilities for agricultural education. Here again we have to recommend only as an interim measure the introduction of a double shift subject to the provisos stipulated in paragraph 4 above. In our final report, we hope to be able to make specific proposals on this point in respect of some of the existing institutions.

37. Since agricultural colleges like other professional colleges receive their intake from the general science colleges, it may be pertinent to observe that in so far as agricultural education is concerned, entry qualifications of candidates require improvement in certain ways, some of which have been referred to in Dr. Mukherjee's note.

38. In view of the urgent need for gazetted staff of the Departments of the Central, Provincial and State Governments, we also urge that the training programme of the Central Institutions be speeded up in all possible ways. We would specially recommend that necessary measures be taken to increase the output from the Indian Agricultural Research Institute, the Indian Veterinary Research Institute, the Indian Dairy Research Institute, etc.

39. We note that the Central Agricultural College has just started functioning and will be producing about 40 graduates in three years time and later on 60 every year. We recommend that the institutions be advised to increase the scope of the training programme so as to be able to train double the present number. The various central plans for agricultural education have been outlined in the annexure to Dr. Mukherjee's note.

For purposes of education, research and their applications, it is desirable to promote ecological studies which have been neglected in the past. Soil surveys on a coordinated all-India basis and establishment of a large number of experimental stations in each region distinguished by climatic and soil conditions is an immediate necessity.

A greater degree of diversification and also flexibility is necessary in the curricula of studies of universities in order that facilities for training and research in a large number of scientific subjects, especially in agriculture, can be provided for. The American unit system is a model which may be adopted with suitable modifications. For example, many chemists should have the option of training in bacteriology or in plant physiology. Similarly, plant physiologists should be able to take supplementary courses in chemistry. Besides, in view of the importance of agriculture, more universities should be encouraged to open faculties of agriculture. Where the resources of any one university may not be sufficient, two or more of them may combine to establish agricultural colleges if geographical and other considerations make it feasible. The resources of universities and colleges for training in the primary sciences may be utilised to a greater extent for developing technical and agricultural education.

40. **Education for Health Personnel.**—From Dr. Raja's note (Part II, Chapter IV) it will be seen that 20 medical colleges (new and converted medical schools together) are being established for undergraduate medical education. While the number of existing colleges is thus being doubled the total output of medical graduates in the country as a whole after five years is likely to be about 1800, an increase of only 80 per cent.

41. If India is to be provided with reasonable medical facilities it is clearly necessary to initiate immediately, measures for stepping up the output of doctors. As a short term measure, we have examined the possibility of introduction of double shift system in medical colleges. We understand that the Calcutta Medical College authorities are prepared to try out the system and it is expected to cost Rs. 1.30 lakhs recurring and Rs. 0.10 lakhs capital expenditure. Subject to the provisos set out in paragraph 4 above we recommend its introduction in the Calcutta Medical College to begin with. The possibility of introducing this system in the G. S. Medical College, Bombay, where the authorities seem hopeful of doing so if adequate help could be given should also be investigated.

42. As a long-term measure to be initiated right now, we support the recommendations of the Bhore committee in the matter of improvement and expansion of the existing colleges. This would lead not only to an improvement of the standard of education but also to an increase in the output by about 53 per cent. over the present level in the country as a whole. We recommend that the Central Government should make available to Provincial Governments a substantial proportion of the capital and recurring grants required.

	Existing College in	
	India (in lakhs of Rs.)	Pakistan. (in lakhs of Rs.)
Capital expenditure	432·0	54·0
Recurring expenditure	115·0	16·5

43. We also recommend that Departments of Preventive Medicine and Public Health should be opened in the Madras Medical College, the Grant Medical College, Bombay, and the Calcutta Medical College. The total expenditure is likely to be—

Capital—Rs. 6 lakhs.
Recurring—Rs. 6.75 lakhs.

44. The development of existing postgraduate training facilities in special branches of medicine in a manner designed to serve the needs of the whole of India, is an urgent need and we recommend the immediate formation of a small committee of experts to inspect centres and report on steps that should be taken to encourage postgraduate and research studies. Fifty scholarships of Rs. 100 per month should be provided each year with immediate effect to encourage such studies. The recurring cost involved is likely to be 0·825 lakhs.

45. We have considered certain proposals for further utilising the present facilities of the All-India Institute of Hygiene and Public Health. The details of this scheme will be found in Dr. Raja's note. Briefly, it involves maximum utilisation of the present facilities, the setting up of a Department of Food Technology and the training of certain types of public health personnel. The expenditure involved is, capital Rs. 2·80 lakhs and recurring Rs. 2·66 lakhs.

46. Facilities for dental education are utterly inadequate at present and we recommend a capital grant of Rs. 1·69 lakhs and a recurring grant of Rs. 1·49 lakhs in each case for the improvement and expansion of the Calcutta Dental College and of the Nair Dental College, Bombay.

47. The training of nurses should receive the highest priority. The Nursing College in New Delhi is the only one of its kind in India and is intended to train public health nurses, a type so far unknown in this country, as well as to provide administrators and teachers in the field of nursing. Future expansion of training in this subject and the development of provincial nursing services will be greatly assisted by increasing the intake of the Nursing College. The details of the recommendations put forward in this connection will be found in Dr. Raja's note. We strongly recommend that the additional staff, equipment and accommodation which are required should be made available without delay. A capital grant of Rs. 1 lakh and a recurring grant of Rs. 1·5 lakhs will be required over and above the present expenditure.

48. The need for increasing the rate of production of health visitors is equally great. The proposal for expanding training facilities at the Lady Reading Health School in Dr. Raja's note has our full support. The proposed annual expenditure of Rs. 71,000 should, we recommend, be sanctioned and the additional accommodation and staff required should be provided.

49. We also warmly commend the training schemes for certain types of non-medical personnel such as health inspectors, health visitors, mid-wives and vaccinators which have been put forward by provincial authorities and suggest that expenditure to the extent of Rs. 11,000 (non-recurring) and of Rs. 2·05 lakhs (recurring) should be sanctioned for a period of three years, at the end of which the position should be reviewed.

50. We also recommend the institution of twelve scholarships for training in medical social work at the Tata Institute of Social Sciences at an annual recurring cost of 0·60 lakhs.

51. A start should also be made during the next six months, with the establishment of a college of pharmacy in Calcutta at an estimated cost of—

Recurring—Rs. 132·8 lakhs.
Capital—Rs. 446·3 lakhs.

SECTION II.—TRAINING OF PERSONNEL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

52. The highest type of scientific and technical personnel required falls into two distinct categories: (a) research workers of the highest type and (b) technical workers with a basic knowledge of the sciences and technologies along with experience of industry. The former category of personnel is drawn from university postgraduates, who have shown a definite flair or disposition for research. The second category of men, who are responsible for the manning of industries is

built of graduates and diploma holders in technological subjects and the question of "conditioning" them for employment will be dealt with in the next Section.

53. The inadequacy of facilities for research, higher study and training in our universities and research institutions has been chiefly responsible for the present rather unsatisfactory state of development of both research and industry. To aggravate matters, many of our universities have not yet established well-equipped (both by way of staff and equipment) post-graduate research departments in the several fundamental and applied sciences. The only way in which we may improve the situation immediately and give impetus to an increase in the outturn of trained scientific workers is to tap the existing universities and research institutions by enabling them to expand their training facilities. We are also of the opinion that the rigidity of the system of training prevalent in certain universities and institutions should be removed and the system made more flexible and diversified so that a wider sphere of activity might be covered. For instance, universities which are well-equipped for research in organic chemistry should expand their activity to include bio-chemistry, fermentation chemistry and other allied subjects, and those having a well-equipped research school in physics should also take up geophysics. Similarly, technical institutions which impart graduate and post-graduate training in mechanical and electrical engineering should be able to take up, for example, communication engineering, chemical engineering, and other allied branches also.

54. A good proportion of the available scientific man-power in the country has not been made use of in a fruitful way in as much as owing to the existing conditions of recruitment to services and other factors many qualified men have not had suitable opportunities of contributing all they could in the sphere of scientific and industrial activity. The prevention of this kind of wastage or drift of scientific talent should engage our immediate attention. As a quick and effective way of assessing the availability of such wasted talent and usefully employing it, we recommend that the necessary information about all trained men who are not profitably engaged at present be collected through advertisement and an attempt made to fit them into their proper places. This measure will help to a better utilisation of the existing resources and will also inspire confidence in the men undergoing training that the State will look after their interests.

55. We consider that the existing centres of research are capable of being better utilised than at present for the training of personnel for scientific and industrial research. Such training should be of two general types, *viz.* (a) higher research and to some extent advanced technological training in special institutions; and (b) post-graduate education with research also leading to a post-graduate degree in Indian universities.

To take the former into consideration first, there are 30 special institutions, as mentioned in appendix 'A' of Sir S. S. Bhatnagar's note (Part II, Chapter I) catering for a wide range of subjects both in the fundamental and applied sciences. We find that a large number of these are fairly well-equipped and well-established research centres; and some like the Government Test House, Geological Survey of India, Ordinance Laboratories, etc., are scientific departments of the Government. Although these latter institutions carry out mostly routine scientific work, as distinct from research they could become no less important as training centres. For scientific workers trained in these places would be useful not only for certain types of research in specialised fields but also if needed in the manning of the departments concerned.

56. Almost all the special institutions mentioned in the Appendix 'A' referred to above have training facilities which may be stretched to train more men than at present. Since the inadequacy of research scholarships has been mainly responsible for the limited use of this facility, the best way of attaining the objective in view is to provide research scholarships on a generous scale.

57. According to appendix 'A' mentioned above, altogether about 300 additional workers may be trained in these special institutions. Eighty of these could be placed for training in non-Government organisations and the rest in the scientific departments of the Government.

As an urgent measure we recommend that eighty research scholarships, each of the value of Rs. 100 per month, be instituted in the following non-government research institutions:

Institution	Number of scholarships
(1) Indian Institute of Science, Bangalore	28
(2) Bose Research Institute, Calcutta	11
(3) Tata Institute of Fundamental Research, Bombay	4
(4) Nutrition Research Institute, Coonoor	8
(5) Cotton Technological Laboratory, Bombay	5
(6) Indian Association for the Cultivation of Sciences, Calcutta	8
(7) Lac Research Institute, Ranchi	5
(8) Jute Research Institute, Calcutta	5
(9) Laboratory of the Indian Academy of Sciences, Bangalore	3 (for the present)
(10) Palaeo Botanical Research Institute, Lucknow University	3

The subject-wise distribution of scholarships proposed above may be decided in consultation with the institute concerned.

58. In addition to the institution of scholarships, we would also recommend that institutes 1, 2, 3, 6, 9, & 10 be each given a capital grant of Rs. 2 lakhs for the immediate purchase of much needed equipment, books, journals, etc., and institutes 4, 5, 7 and 8 each a capital grant of Rs. 50,000 for the same purpose. We would also recommend that the above institutes be each given a recurring grant of Rs. 25,000 for their expanded activities.

59. We have already referred to the 20 scientific departments of the Government, which are in a position to provide training facilities for 200 additional workers. Generally due to various administrative reasons these departments are not at present admitting trainees, and have thereby shut off very useful training centres. We feel that the present situation calls for an early examination of the question so that facilities available in these places may be fully utilised to bring about a quick increase in the supply of trained scientific workers. We feel that the various departments should be able to train additional men as indicated below:

Department	No. of additional men.
Forest Research Institute, Dehra-Dun	12
Haffkine Institute, Bombay	10
Biochemical Standardisation Laboratory, Calcutta	5
Geological Survey of India	12
Ordnance Laboratories	20
Directorate General of Observatories	25
All-India Radio	10
Government Test House, Alipore, Calcutta	15
Metallurgical Inspectorate	5
Inspectorate of Military Explosives	4
Survey of India	10
Mathematical Instruments Office, Calcutta	5
Civil Aviation Directorate	10
Posts & Telegraphs Department Workshops and Laboratories	20
Zoological Survey of India	5
Botanical Survey of India	6
Central Waterways, Irrigation and Navigation Commission and Waterways Experimental Stations	12
Central Public Works Department	15
Imperial Dairy Institute	8
Provincial Industrial Research Laboratories	5

We recommend that all the above institutions be asked to submit detailed proposals in respect of scientific training, preferably on the same lines proposed for non-government organisations, and the Government give immediate effect to such proposals.

60. We have examined with interest a scheme of Railway Scientific Research described in Sir S. S. Bhatnagar's Note (Part II, Chapter I) and commend it to the Government. Our railways and their workshops and laboratories constitute ideal training centres for scientific and technical workers in all problems relating to railway and we should not fail to utilise these facilities. There are at present six laboratories and 10 workshops attached to the State Railways where facilities for research in chemical, metallurgical and other allied fields exist. The scheme put forth proposes to mobilise these facilities for the organisation of an efficient Railway Scientific Research Section, where about 200 research workers may be trained. We recommend that the scheme be approved, a recurring grant of Rs. 3·42 lakhs made and a Director of Railway Scientific Research be appointed to work out the details of the scheme.

61. We have also noted that the existing laboratories of the Council of Scientific and Industrial Research can provide for the training of about 20 additional research workers in various branches of Chemistry, Physics, Glass and Ceramics and Fuel, and recommend that the Council be asked to organise immediately such training. We further recommend that the Council be given such grants as are necessary for the purpose. It is likely that this training programme would entail a recurring grant of Rs. 35,000 for 20 research scholarships each of Rs. 100 p.m. and Rs. 10,000 towards miscellaneous or contingent expenses.

62. Next to special institutions, the universities and other educational institutions constitute the most important centres for the training of personnel in scientific and industrial research. In Appendix B of Sir S. S. Bhatnagar's note is given a comprehensive statement of the facilities available in various Indian Universities, and the urgent measures which should be given effect to, in order to increase the outturn of research workers and also the probable number of additional men each University will be in a position to admit in the immediate future. From these data we find that only the universities of Calcutta, Bombay, Andhra, Benares, Lucknow, Allahabad, Aligarh, Dacca and Punjab have fairly well-equipped post-graduate research departments and the universities of Madras, Nagpur, Delhi, Patna, Annamalai and Agra are not so good in this respect. The Sind University has just been established and it will be some time before this university could come into its own. From the information presented, it is obvious that our aproach to the problem of research training in universities should be two-fold, *viz.* an immediate all-round strengthening of the existing post-graduate departments in all Indian Universities both by way of equipment and research scholarships and the creation of post-graduate research departments for certain important subjects in such of the universities as do not have them at present. We would, therefore, recommend to the Government that: (a) the post-graduate research departments of the following universities be given the grant noted against them:

University	Grants	
	Capital	Recurring
(1) Calcutta . .	Rs. 2 lakhs . . .	25 scholarships each of the value of Rs. 100 p. m. and Rs. 50,000 as contingencies.
(2) Bombay . .	2 lakhs . . .	15 scholarships of the value of Rs. 100 p. m. and Rs. 50,000 as contingencies.

University	Grants	
	Capital Rs.	Recurring
(3) Andhra . .	2 lakhs . . .	10 scholarships each of the value of Rs. 100 p. m. and Rs. 30,000 as contingencies.
(4) Benares . .	2 lakhs . . .	20 scholarships each of the value of Rs. 100 p. m. and Rs. 40,000 as contingencies.
(5) Lucknow . .	2 lakhs . . .	6 scholarships each of the value of Rs. 100 p. m. and Rs. 20,000 for contingencies.
(6) Allahabad . .	2 lakhs . . .	6 scholarships each of the value of Rs. 100 p. m. and Rs. 20,000 for contingencies.
(7) Aligarh . .	2 lakhs . . .	10 scholarships each of the value of Rs. 100 p. m. and Rs. 40,000 for contingencies.
(8) Punjab . .	2 lakhs . . .	10 scholarships each of the value of Rs. 100 p. m. and Rs. 30,000 for contingencies.
(9) Dacca . .	2 lakhs . . .	8 scholarships each of the value of Rs. 100 p. m. and Rs. 20,000 for contingencies.

and (b) the following universities be given the grants noted against them for expanding their post-graduate departments and also to start new post-graduate research departments in the subjects in which they can do so immediately (the grants recommended include expenditure for the creation of professorships, readerships and other tutorial staff):

University	Grants	
	Capital Rs.	Recurring
(1) Madras . .	5 lakhs . . .	8 scholarships each of Rs. 100 p. m and Rs. 1·75 lakhs towards teaching staff and contingencies.
(2) Nagpur . .	5 lakhs . . .	5 scholarships each of Rs. 100 p.m. and Rs. 1·05 lakhs towards teaching staff and contingencies.
(3) Delhi . .	5 lakhs . . .	4 scholarships each of Rs. 100 p. m. and Rs. 1·05 lakhs towards teaching staff and contingencies.
(4) Agra . .	5 lakhs . . .	2 scholarships each of Rs. 100 p. m. and Rs. 1·05 lakhs towards teaching staff and contingencies.
(5) Patna . .	5 lakhs . . .	5 scholarships each of Rs. 100 p. m. and Rs. 1·05 lakhs towards teaching staff and contingencies.
(6) Annamalai . .	5 lakhs . . .	4 scholarships each of Rs. 100 p. m. and Rs. 1·05 lakhs towards teaching staff and contingencies.

In addition to above firms there is a large number of industrial concerns as for example, the Ordnance factories, Explosive factories, the Mint, printing of the Government. These have good training facilities.

Institutions	Grants—Recurring
(1) Bengal Tanning Institute . . .	5 scholarships each of Rs. 100 p. m. and Rs. 15,000 for contingencies.
(2) Leather Trades Institute, Madras . .	5 scholarships each of Rs. 100 p. m. and 12,000 for contingencies.

Institutions	Grants—Recurring
(3) Harcourt Butler Technological Institute	4 scholarships each of Rs. 100 p. m and Rs. 12,000 for contingencies.
(4) Kerala Soap Institute, Calicut . .	3 scholarships each of Rs. 100 p. m. and Rs. 12,000 for contingencies.
(5) Imperial Institute of Sugar Technology, Cawnpore.	4 scholarships each of Rs. 100 p. m. and Rs. 12,000 for contingencies.
(6) Indian School of Mines, Dhanbad . .	5 scholarships each of Rs. 100 p. m. and Rs. 12,000 for contingencies.

The total grant, which we have recommended above for the expansion of research facilities in special institutions and universities will be:

Capital . . . . . Rs. 62 lakhs.
Recurring . . . . . Rs. 19·948 lakhs.

63. **Special measures to be initiated within the next six months.**— The question of providing expanded facilities for the training of personnel in scientific and industrial research is closely linked up with the general question of organisation and development of scientific research in the country. The recommendations which we have made in the preceding sections are merely in the nature of interim measures for bringing about an immediate increase in the outturn of scientific manpower in the country, and do not fulfil all our requirements in respect of development of scientific research. Long term measures will, therefore, have to be formulated. Since these are equally urgent and important, we have examined the general question in the light of recommendations, made at various times, especially the recommendations of the Industrial Research Planning Committee. Of the various recommendations of the Research Planning Committee the following are of far reaching importance not merely for research development but also in the present context of research training: (i) Levy of a statutory cess (1/16 of 1 per cent.) on industry on the basis of industrial production or as a small surcharge on income-tax so as to realise at least Rs. 1 crore for supplementing the grant from the Government for research; (ii) Block grant or Rs. 6 crores from the Government (spread over a period of 5 years) for establishment of various National Laboratories and for providing funds to universities and special institutions for research in all the sciences and technologies; (iii) Annual recurring grant of Rs. 1 crore from the Government for ensuring the continuity of research activities on a progressive scale.

We are of the opinion that inasmuch as the above recommendations relate not only to the organisation and development of scientific research in the country but also to the outturn of scientific manpower, they should be given effect to immediately. The principle of levying cess on industry has been accepted by the Government in the late Planning and Development Department but has not yet been translated into action. We, therefore, strongly urge that immediate action on the recommendations of the Industrial Research Planning Committee, especially in regard to the levy of cess on industry for research purposes be initiated.

SECTION III.—INDUSTRIAL TRAINING

64. In this Section we propose to deal with advanced and foremanship training in industrial concerns. Many major industrial concerns in the country, especially those in the fields of iron and steel metallurgy, engineering, heavy chemicals, pharmaceuticals and drugs, soaps, oils and fats, paints and varnishes, cement, sugar and alcohol, mineral oils and mining, have good facilities for both advanced and foremanship training of technical personnel. But a majority of these firms are at present rather luke warm in the matter of admitting trainees in numbers larger than required for their own purpose. This

situation has contributed in no small measure to a denial of opportunities to suitably qualified students, seeking necessary training in industry. We sincerely hope that industry will come to appreciate that it would be in their own interest to take a more enlightened view in the matter. As we have stated earlier in this chapter, it may perhaps become necessary for the Government to introduce suitable legislative measures so that it becomes incumbent on every established industrial concern to provide facilities for technical training to qualified young men in all the grades notwithstanding whether the personnel thus trained would be required by the concern or not. We also recommend that in every contract entered into by the Government for the purchase of industrial machinery, plant and equipment from foreign and Indian firms there should be provision in the terms of purchase for the training of a suitable number of Indians in the workshops of the firms.

65. Training in industrial concerns may be brought under two general categories: (i) advanced practical training of graduates and to some extent research; (ii) semi-advanced or foremanship training. At present we have not been able to obtain correct information regarding the various industrial concerns in the country which are willing to admit additional men for training in the immediate future and the number of men who could be thus admitted into the various categories of training. In appendix 'C' of Sir S. S. Bhatnagar's note, however, is presented whatever information is available in this respect. A summary of these particulars is given below to indicate the total number of major concerns in the country in each important industry and the probable number of additional men who may be trained.

Industry	Additional Number of workers to be trained
(1) Iron & Steel—12 concerns	20
(2) Refractories—6 concerns	5
(3) Associated Industries— 4 firms	Not definitely known.
(4) Non-ferrous metallurgical industries—10 firms	5
(5) Engineering Industries—24 firms	50
(6) Electrical Industries— 23 firms	50
(7) Ship-building & Marine Engineering—8 firms	15
(8) Air craft (Assembly & maintenance)—1 firm	20
(9) Scientific stores—11 firms	8
(10) Coking & Carbonisation Industries — 6 firms	5
(11) Heavy Chemicals and Chemical Industries — 29 firms	15
(12) Soaps & Cosmetics — 10 firms	15
(13) Textiles (over 50 groups of Mills)	100
(14) Tanning, Teather & Leather Products (over 10 firms)	25
(15) Paints, Varnishes & Associated Industries (16 firms)	35
(16) Paper (over 7 firms)-	10
(17) Sugar and alcohol (over 25 firms)	50
(18) Glass & Ceramics (22 firms)	20 (not definite).
(19) Cement (over 15 firms)	20
(20) Rubber (7 firms)	5
(21) Oil Companies and Petroleum Refineries (2 firms)	Not definitely known.
(22) Manganese Mining (3 firms)	Do.
(23) Copper Mining (1 firm)	Do.

In addition to above firms there is a large number of industrial concerns as for example, the Ordance factories, Explosive factories, the Mint, printing presses, Railway workshops, etc., under the direct administration and control of the Government. These have good training facilities.

66. From the foregoing it is obvious that an immediate increase in the outturn of trained technical personnel may be brought about if the facilities available in all industrial concerns including Government establishments in

the country are fully mobilised. We attach considerable importance to this and recommend that arrangements be made for the practical training of 300 graduates and for the foremanship training of about 500 men in the immediate future. We also recommend the following tentative distribution of the trainees among the various industries:

	Advanced	Foreman
Iron and Steel Metallurgy	20	45
Refractories	5	8
Associated Industries	3	5
Non-ferrous Industries	5	8
Engineering Industries	30	50
Electrical Industries	20	35
Ship-building and Marine Eng.	10	15
Air-craft	5	8
Scientific stores	5	8
Coking and Carbonisation	5	8
Heavy Chemicals and Pharmaceuticals and Drugs	30	50
Soaps, fats and oils	10	15
Textiles	25	40
Leather	10	15
Paints and varnishes	10	15
Paper	1	15
Sugar and alcohol	20	35
Glass and Ceramics	15	24
Rubber	5	8
Cement	10	15
Defence Industries	20	35
Railway Engineering	12	20
Mint	5	8
Printing	10	15

We should, however, like to see a larger proportion of foremen trained.

Training in industrial concerns may be best provided by selecting suitably qualified men and assigning them to verious factories. The selected men should be given attractive stipends—at least Rs. 100 per month for advanced training and Rs. 75 per month for foremanship training; and should be placed under the top technical executives of the concerns so that they may receive the best of attention. Advanced industrial training should, as far as practicable, include training in design and research also. Provision should also be made for the proper supervision of the trainees. We recommend that a total recurring grant of Rs. 8.2 lakhs be sanctioned by the Government for this industrial training scheme. Further we also recommend that the Government may provide whatever additional facilities the factories concerned might require by way of housing accommodation for the trainees, additional laboratory equipment for research, etc.

67. 'A' grade technicians are experts and specialists in the subject and in most cases it is difficult to provide for their satisfactory training in India. The Overseas Scholarship Scheme was, therefore, introduced by the Government to meet this situation. But at present great difficulties are being experienced in finding admission for these students in institutions abroad. We, therefore, suggest as an urgent measure that a certain number of 'A' grade technicians be trained in India. A tentative priority list of subjects in which training can be imparted in India has been indicated in Dr. Ray's note (Part II, Chapter V). We hope to be in a position to formulate detailed proposals in this matter later.

68. We have already referred in brief to the question of training of 'C' grade technicians, although this matter does not come strictly within our purview. We, however, recommend further that a fund of Rs. 5 lakhs should be provided for instituting a system of scholarships to make it possible for 'C' grade technicians already engaged in Industry to undergo a short refresher and supplementary course in suitable institutions or industrial concerns. This refresher course should be arranged in co-operation with the railway workshops, ordnance factories and the various engineering firms.

Section IV.—Technical Training for Defence Services

69. Owing to various reasons Defence Services have so far remained an excluded field and consequently, we are unable to assess the requirements of scientific and technical personnel for the various branches of the services. Working as we are under these handicaps, we are unable to formulate any specific proposals for the immediate filling in of the existing lacunae if any. However, in view of the imminent constitutional changes in the country with the consequent changes in the organisational set up of the services both on the operational side and on the technical side, we have felt it necessary to examine at this stage the subject of Defence in its general technical aspects, so as to be able to suggest certain essential and immediate measures that might be a sort of 'path-finder' for a future comprehensive plan. For this purpose we have had the note prepared by Wing Commander Singh (Part II, Chapter VI) as a basis although it refers chiefly to the Air Forces.

70. It has been brought to our notice that certain recommendations of the Pay Commission are likely to affect adversely the efficiency of the Technical Arms of the Defence Services. We wish to bring it to the notice of the Government that unless the status of technical and scientific men in the services as in other services is improved the efficiency of Defence Services will greatly suffer. Since, however, this question is closely linked up with the larger general question of status of scientists and technical men we defer making any definite recommendations in the matter here.

71. Although during the war, a certain amount of co-operative research was carried out between the Defence Department and certain civilian research organisation, we regret to have to say that the Defence Organisation of the country has not become research conscious and consequently there has been poor development of defence research. The chief contributory factor to this state of affairs has been that the Defence Forces in India have so far been staffed and manned by British Officers, who depended on British resources for scientific developments. Now that the power of administration and defence of the country is going to pass into our hands it is imperative that we should build up a strong defence organisation on up-to-date and scientific lines. For this, we need to organise defence research on an extensive scale with strong scientific sections to deal with the training and utilisation of resources available in the country for forward advance in the manufacture of defence materials. Our considered recommendation in this respect, therefore, is that the Defence Department should be asked to formulate a project which should include research, design and engineering construction for the several branches of the Defence Forces viz. Army, Navy and Air Forces; and the project should be examined by a commission of experts.

Since Defence research cannot make any progress without the co-operation of civil research, we also recommend that effective liaison between the Civil and the Defence Organisations be established immediately. We understand

that a scientific adviser appointed by the Government has made certain recommendations for the development of the scientific and technical side of the Defence Services. We urge that the report of this expert be made available to Scientific Man-power Committee.

72. In the matter of technical training for Defence Services we have already referred to the inadequacy of information. It is, therefore, essential that the necessary information should be collected by the Defence Department and examined immediately. Meanwhile, on the basis of information presented in Wing Commander Singh's note relating to Air Force requirements we propose the following urgent measures for adoption:

(a) The existing scheme of technical training in Civil Aviation be correlated with that in the Royal Indian Air Force. This measure will not only quicken the pace in the training of mechanics but will also enable us to create a common pool of trained men for sharing it between the two organisations.

(b) The Civil Aviation Training Centre at Saharanpur should be utilised for the training of both the Air Force and the Civil Aviation personnel.

(c) Ground engineers in Civil Aviation with A, B, C, D & X licenses should be employed by the Air Force; and the Air Force should be fully represented on the examination boards and the certificates endorsed as 'Acceptable to the Defence Services.'

(d) For the development of radio research the Indian Institute of Science, Bangalore, the Universities of Calcutta and Allahabad and the National Physical Laboratory should be enabled to expand their facilities so that a large number of research workers may be admitted.

Section V.—Shortage of Equipment and other Related Questions

73. Elsewhere we had occasion to refer to the shortage of essential laboratory equipment in our educational research institutions. We feel, however, that the matter is so important that it deserves special consideration. During the war years most of our educational and research institutions have greatly suffered in the matter of scientific instruments and apparatus, due to various disabilities as for instance lack of funds, import control restrictions, etc. These handicaps continue in a large measure even now; and unless they are removed immediately, it will be almost impossible for the institutions to expand their training facilities and increase the outturn of scientific manpower in the country. The situation calls for quick action and we strongly urge the Government to give top priority to the import of scientific equipment for educational and research institutions. We also urge that the Government should remove all restrictions on import of scientific equipment and endeavour to secure from abroad through the supply missions or other official channels whatever equipment the institutions concerned fail to obtain themselves. The Government should also encourage Indian concerns to manufacture scientific and technical equipment. If the government allows a rebate on the import duty of scientific equipment it would be giving considerable help to the institutions. We commend this for the earnest consideration of the government.

74. On the cessation of the war a considerable amount of scientific stores and equipment of educational value was rendered surplus and these are now being released for civilian use. But due to the existing disposals policy of the Government a large part of the valuable materials of educational value is passing into the hands of private dealers and the hard-pressed educational institutions are

being deprived of much needed equipment. We take a serious view of the matter and desire that the present disposals policy should be reviewed. We have projected in this report a plan of scientific and technical training in various institutions in the immediate future which entails a supply of a fair amount of scientific apparatus and equipment to the institutions. Unless the necessary equipment is provided to the institutions we are afraid the plan may very well fail to produce the desired result. Under the existing circumstances, it is difficult to obtain all the needed equipment from abroad even if there is enough money for it. Recourse will, therefore, have to be had to our own resources in the country of which the surplus war goods form a valuable part. We strongly urge the government to reconsider its disposal policy in the light of these circumstances and take such measures as are necessary to ensure that surplus war goods of scientific value are made easily available to educational and research institutions and as far as possible without cost.

75. **Housing.**—The next important question is the housing accommodation for additional men who will have to undergo the proposed training in universities, special institutions and industry. There is already acute shortage of hostel or suitable housing accommodation in every educational institution in the country. Industrial concerns are also hard pressed in this respect and many of them, although willing to take apprentices in large numbers have been compelled to greatly restrict admissions on this ground. This is a serious situation and needs looking into soon. For otherwise, it will become worse and no institution or factory will be able to take in additional men under our proposed training programme. The government should immediately evolve a suitable machinery for expediting building construction especially at various training centres and also provide necessary funds for the purpose. We suggest the following concrete steps:—

(a) construction of additional wings to the existing hostels in universities, research and technical institutions where the additional men are intended to be trained and the cost of such construction to be borne partially or entirely by the Government.

(b) construction of residential buildings in factories, where training is to be provided on the basis of 50 per cent of the cost as interest free loan to the industrial concerns, the loan to be repaid to the government in instalments and the buildings constructed to become the property of the concerns after a certain period when the loan has been repaid. It is hoped that the concerns will welcome this proposal.

Section VI.—Steps to Expedite Government Projects

76. Before we close this chapter, we feel it necessary to mention that we have been told that great difficulties are being experienced in implementing most of the Governmental schemes for the improvement and expansion of research and training facilities. Even though the subject does not come strictly within our terms of reference, we feel it incumbent on us to make a reference to some of the difficulties which have been brought to our notice, and to suggest steps that the Government may take to overcome them.

We are informed that:

(I) It is difficult to secure suitably trained men, especially in the higher cadres owing to

(a) the lack of proper appreciation of the services which scientists can render and consequent relegation of scientists to a status subordinate to administrators;

(b) the prevailing system of recruitment through the Federal Public Service Commission; (scientists of good standing do not normally respond to advertisements and can be secured only through negotiation);

(c) the generally low salaries attached to scientific posts;

(d) the lack of funds and the machinery whereby teaching and research institutions can benefit by sending their experienced men to visit the well-known world centres of training and research;

(e) the inadequacy of the number of scholarships available for research and post-graduate training.

(II) Most of the institutions are hopelessly out of date in the matter of equipment and what they possess require complete overhauling.

(III) A great deal of time is wasted in getting buildings planned and executed through the Government agencies.

(IV) A great deal of time is wasted owing to the necessity of getting the administrative department's sanction on major as well as minor issues relating to staff, equipment, etc.

77. In our opinion the above difficulties can be overcome if the Government agree to

(I) Leave it to the administrative department to decide as to how any particular scientific or technical post should be filled. The normal procedure of recruitment through the Federal Public Service Commission may be followed generally but in special cases at the discretion of the administrative department, posts may be filled by negotiation with prospective candidates through the medium of a selection committee, with which, if necessary, it may be possible to associate the Federal Public Service Commission.

(II) Create a Scientific Service equal in status and emoluments to administrative services, similar to that created in Great Britain.

(III) Improve the salary scales of teachers especially those engaged in technical education.

(IV) Provide funds to enable the institution to send their experienced staff overseas to visit important centres of scientific and technical education and research.

(V) Institute a large number of scholarships for post-graduate and research training in institutions in India.

(VI) Assist institutions to bring their equipment up-to-date.

(VII) Afford the fullest scope to Indian agencies to manufacture and wherever necessary import scientific and technical equipment.

(VIII) Authorise the administrative department to set up a Building Committee on which representatives of the Central Public Works Department and the Finance Department may sit together with departmental representatives and wherever necessary, to entrust the department at its discretion to have their buildings planned and executed through private agencies.

(IX) Delegate a greater amount of power than at present to heads of educational and research institutions.

(X) Place at the disposal of institutions funds in the form of block grants to implement programmes approved by the Government. The procedure for expending these grants should be simplified so as to give the greatest amount of freedom to the head of the institution, consistent with due safeguards, to enable the programme to be put into execution speedily and effectively.

(XI) Decisions on technical matters should be arrived at in full consultation with scientific and technical men of the department concerned at all stages. Any change, in technical proposals including policy should be effected only after giving technical men the fullest opportunity to represent their view point.

78. The Sub-committee desires to place on record its high appreciation of the valuable services rendered by Dr. S. R. Sen Gupta and Mr. L. S. Chandra Kant in the preparation of this report.

Sgd. S. S. Bhatnagar,
A. N. Khosla,
J. N. Mukherjee,
K. C. K. E. Raja,
J. N. Ray,
[illegible] Singh
D. N. Wadia,
S. R. Sen Gupta,

NEW DELHI,
August 3, 1947.

CHAPTER II

Summary of Recommendations

The Sub-committee of the Scientific Manpower Committee makes the following recommendations to the Government of India for immediate implementation:

I. For an immediate improvement in the out-turn of scientific man-power the Government should utilise the existing sources, *viz.*, universities special institutions and the industrial concerns by helping to create in these places adequate facilities for higher education, research and practical training. Such help as is to be given should largely be in the form of grants for (a) the creation of scholarships on a generous scale, (b) the purchase of equipment, (c) the opening of post-graduate research departments in the universities, which do not have any at the moment. In addition to above, the several educational development plans, which have been prepared by the Departments of Education etc., should be pushed through, immediately.

For the objectives generally set forth above the sub-committee makes the following detailed recommendations under various heads.

II. Education:

(a) *Basic scientific education*

A substantial increase in the facilities for education in general science up to the Intermediate Science and B.Sc. standards should be aimed at so that the output from these courses may be adequate to feed the post-graduate institutions: (Para 3, Chapter I).

As an interim measure to meet present emergency double shifts should be introduced in such institutions where there is some spare teaching accommodation and equipment but a completely new set of staff should be engaged for the second shift. The Government should, wherever the introduction of double shift is concerned feasible, come to the aid of the institution by bearing a share of the expenses on staff salary and contingencies; and by assisting the institution in securing a certain amount of equipment and building materials. (Para 4, Chapter I).

The Provincial Governments should be requested to convert without delay some of their existing ordinary High Schools into Technical High Schools. (Para 5, Chapter I).

(b) *Higher Scientific Education*

The Government of India should come to the aid of all universities by giving them suitable financial assistance to expand their post-gradauate departments so that the output of post-graduate science students may be increased. (Para 6, Chapter I)

The recommendations of the Geological Education Committee should be acted on immediately so that trained geologists adequate in number may be available for the survey and development of India's mineral resources. The Geological Survey of India should increase the number of their present training camps so as to be able to train annually at least 50 geologists in field work. (Para. 7 & 8, Chapter I).

(c) *Engineering and Technological Education*

In the matter of education in engineering and technology a short term and a long term programme should be initiated within the next six months:

Short-term programme:

Introduction of an intensive 12 month training programme of M.Sc.'s and graduates in Chemical Technology to be run on a co-operative basis between (14 different technical institutions and corresponding industries) at a cost of Rs. 34 lakhs in capital and Rs. 13·3 lakhs in recurring. (Para 15, Chapter I).

The universities should introduce 3-year degree course in engineering as proposed by the All-India Council for Technical Education. (Para 16, Chapter I).

Double shift system should be introduced in engineering colleges, if conditions justify. (Para 17, Chapter I).

Wherever possible use should be made of the teaching facilities of the science departments of general colleges to assist in the education in basic sciences for engineering students. (Para 18, Chapter I).

As an interim measure, engineers in Government service should be encouraged to assist in the instruction in engineering colleges. (Para 19, Chapter I).

Long-term Programme:

For ensuring co-ordinated development of technical education and generally to raise its standard, the Regional Committees, recommended by the All-India Council for Techincal Education be established immediately. (Para 22, Chapter I).

For the improvement of the standard of education as well as the expansion of some of the institutions of engineering and technology, so that the present facilities may be fully utilised the Government of India should immediately make grants to such institutions as are recommended by the All-India Council for Technical Education. The grants required will be about Rs. 2 crores capital spread over 5 years and Rs. 31 lakhs recurring. (Para 23, Chapter I).

Building construction at present contemplated to increase the annual intake of architecture and engineering classes of the Delhi Polytechnic should be expedited. The existing unsatisfactory conditions in the Delhi Polytechnic, especially in the matter of salaries to teachers, accommodation etc. should be removed and certain departments of the institution should be affiliated to the Delhi University. The government should also consider the desirability of setting up a small technical committee to advise the governing body of the Polytechnic. (Paras 24, 25 Chapter I).

The Indian Institute of Science should be urged to expedite the opening of the Power Engineering Department so that the outturn of engineers, adequately qualified to handle hydroelectric power development projects etc. may be available soon. (Para 27, Chapter I).

Within the next six months the Government should complete the purchase of the sites and appoint the planning staff and if possible arrange to hire temporary buildings for starting work on the Eastern and the Western Higher Technical Institutions. (Para 29, Chapter I).

The Government should give immediate effect to the recommendations of the Indian School of Mines Reorganisation Committee for

the improvement and expansion of facilities for mining and applied geological education. (Para 30, Chapter I).

The scheme of training of 'C' grade technicians prepared by the Department of Labour should be put into operation as far as possible within the next six months. For this purpose and for the training of craftsmen or overseers, the Government should take over some of the private engineering schools and develop them. (Paras 31, 32, Chapter I).

For the special needs of leather and foot-wear industries leather chemistry should be introduced as one of the subjects in the M.Sc. Industrial Chemistry course and the existing training institutions in leather technology should be made more efficient and useful by adding to their equipment and by enabling them to have better paid staff. (Para 33, Chapter I).

(d) *Agricultural Education*:

(i) For the co-ordinated development of agricultural education, the Government should constitute on an all-India basis an Advisory Council for Agricultural Education. (Para 35, Chapter I).

(ii) In order to bring about an improvement in the flow of trained personnel the system of double shift should be introduced wherever possible, as an interim measure. (Para 36, Chapter I).

The programme of development of training and research facilities of the Indian Agricultural Research Institute, Central Agricultural College and other Central Research Institutes dealing with different aspects of agriculture forestry, and fisheries should be implemented and all facilities given to increase the scope of the training programme so as to be able to train double the present number.

(iv) The Indian universities should be encouraged by financial grants and otherwise to establish and/or develop their facilities of agriculture and diversify the scope of their training.

(e) *Medical Education*

For an immediate increase in the outturn of medical personnel, the double shift system should be tried as an interim experimental measure, in the Calcutta Medical College and a grant of Rs. 1·3 lakhs in recurring and Rs. 0·10 lakhs in Capital be made for the purpose. The possibility of introducing this system in the G.S. Medical College, Bombay, should also be investigated. (Para 41, Chapter I).

As a long term measure the following grants should be sanctioned for the general improvement and expansion of training facilities in the existing medical colleges and certain other purposes.

(a) Existing Colleges in.

	India (in lakhs of rupees)	Pakistan (in lakhs of rupees)
Capital expenditure	432·0	54·0
Recurring expenditure	115·5	16·5

(b) Rs. 6 lakhs capital and Rs. 6·75 lakhs recurring for starting departments of Preventive Medicine and Public Health in the Medical Colleges of Bombay and Calcutta.

(c) Rs. 0·825 lakhs for instituting 50 medical research scholarships at various centres in India.

(d) Rs. 2·8 lakhs capital and Rs. 2·66 lakhs recurring for expanding the existing training facilities of the All-India Institute of Public Health and Hygiene.

(e) Rs. 3.38 lakhs capital and Rs. 2.98 lakhs recurring for the improvement and expansion of the Calcutta Dental College and the Dental College in Bombay.

(f) A capital grant of Rs. 1 lakh and a recurring grant of Rs. 1.5 lakhs to the Nursing College over and above present expenditure.

(g) A recurring grant of Rs. 71,000 to the Lady Reading Health School, Delhi, for the next three years.

(h) Rs. 2.05 lakhs recurring and Rs. 11,000 capital for schemes for training of certain types of non-medical personnel such as midwives, health inspectors, health visitors and vaccinators in the provinces.

(i) Rs. 0.60 lakhs recurring for instituting 12 research scholarships in medical and social welfare work at the Tata Institute of Social Sciences, Bombay.

(j) Rs. 446.3 lakhs capital and Rs. 132.8 lakhs recurring for a college of Pharmacy in Calcutta, a start being made within the next six months. (Paras 42 to 51, Chapter I).

III. Scientific Research Training

The rigidity of the system of training obtaining in certain universities, and research institutions should be removed and the system made more flexible and diversified so that a wider field of activity could be covered. (Para. 53, Chapter I).

The drift or wastage of scientific talent now going on should be prevented; and such available talent should be assessed and properly made use of. (Para 54, Chapter I).

For an immediate improvement in the research training facilities in universities and special institutions the following measures should be given effect to:

(a) the institution of 250 scholarships in Indian universities and non-government research institutions at an estimated expenditure of Rs. 3 lakhs in recurring.

(b) Creation of 20 professorships, 20 readerships and 40 lectureships in certain universities.

(c) The Universities of Madras, Nagpur, Delhi, Agra, Patna and Annamalai be asked to start postgraduate research departments in certain important subjects and a total grant of Rs. 30 lakhs in capital and Rs. 7.0 lakhs in recurring [which includes (b) above] be sanctioned.

(d) The Universities of Calcutta, Bombay, Andhra, Benares, Lucknow, Allahabad, Aligarh, Punjab and Dacca be asked to expand their research training facilities by way of equipment, library, etc. to take in additional workers and that a total grant of Rs. 18 lakhs in capital and Rs. 3 lakhs in recurring be sanctioned.

(e) The Indian Institute of Science, Bose Research Institute, Tata Institute of Fundamental Research, Nutrition Research Laboratory, Cotton Technological Laboratory, Indian Association for the Cultivation of Science, Lac Research Institute, Jute Research Institute and the Laboratories of the Indian Academy of Sciences and the Palaeo Botanical Research Institute be asked to expand their research facilities to accommodate more workers and that a grant of Rs. 14 lakhs in capital and Rs. 2.50 lakhs in recurring be sanctioned for the purpose.

(f) The Council of Scientific and Industrial Research be asked to admit at least 20 research workers for training in their present laboratories and that a grant of Rs. 35,000 in recurring be sanctioned for the purpose.

(g) The Bengal Tanning Institute, Leather Trades Institute, Madras, Harcourt Butler Technological Institute, Kerala Soap Institute, Imperial Institute of Sugar Technology and the Indian School of Mines, be asked to expand their research facilities to take in more men and that a grant of Rs. 0.75 lakhs in recurring be sanctioned for the purpose.

(h) The various scientific departments of the Government which are about 20 in number be asked to formulate immediately proposals for the training of as many men as possible, not less than 200 in any case for all the departments and the Government take appropriate action of the proposals.

(i) A scheme of Railway Scientific Research for the training of about 200 workers be instituted immediately, and a grant of Rs. 3.42 lakhs in recurring be sanctioned for the purpose.

(j) For the organisation and development of scientific and industrial research in the country the government should implement the recommendations of the Industrial Research Planning Committee especially in regard to the levy of statutory cess on industry for research purposes. (Paras 55 to 63, Chapter I).

IV. Industrial Training

All the established industrial concerns in the country should be approached to provide facilities for advanced and lower grades of training in their factories for more men. In case the response from the concerns is poor the government should introduce suitable legislative measure whereby it should become incumbent on industrial concerns to provide technical training for qualified students notwithstanding whether the personnel thus trained would be required by the particular concerns or not. (Para. 64, Chapter I).

In all contracts entered into by the Government for the purchase of industrial machinery, plant and equipment from foreign and Indian firms there should be a provision in the terms of purchase for the training of a suitable number of Indians in the workshops of the firms. (Para. 64. Chapter I).

The following immediate programme of training of men in industry should be implemented:—

(1) Advanced training of 300 men in 24 major industries at an estimated cost of Rs. 3.6 lakhs recurring.

(2) Foremanship Training of 500 men in 24 major industries at an estimated cost of Rs. 4.6 lakhs recurring. (Paras 65 and 66, Chapter I).

V. Technical Training in Institutions

A certain number of 'A' grade technicians (experts) should be trained in India possibly in accordance with the tentative list of priority subjects drawn up by the Sub-committee. (Para. 67, Chapter I).

A scheme of imparting an immediate intensive shortcourse training to 'B' grade technicians as mentioned in II(C) should be implemented forthwith.

A grant of Rs. 5 lakhs be made for instituting a system of scholarships to make it possible for 'C' grade technicians already engaged in industry to undergo a short refresher and supplementary course in suitable institutions or industrial concerns. (Para 68, Chapter I).

VI. Defence

The Defence Organisation of the country should be developed on up-to-date scientific lines partly by organising defence research on an extensive scale, through a strong scientific section dealing with the training and utilisation of

resources available in the country for forward advance in the manufacture of defence materials. For this purpose the Defence Department should be asked to formulate a scientific project which should include research, design and engineering construction for the several branches of the Defence Forces viz. Army, Navy and Air Forces and the project examined by a Commission of Experts. (Chapter I, para. 71).

Since Defence Research cannot progress without the co-operation of 'Civil' research effective liaison should be established immediately between the 'Civil' and 'Defence' organisations. (Para 71, Chapter I).

Adequate information relating to the requirements of the Defence Organisation in respect of scientific and technical man-power being not available at this stage, the necessary details should be collected from the Defence Department immediately and examined. (Para 72, Chapter I).

With reference to the Air Forces the following measures should be adopted as far as practicable:—

(a) The existing scheme of technical training in civil aviation be correlated with that in the R.I.A.F. This measure will not only quicken the pace in the training of mechanics but will also enable us to create a common pool of trained personnel between the two organisations.

(b) The Civil Aviation Training Centre at Saharanpur should be utilised for the training of both the Air Force and the Civil Aviation personnel.

(c) Ground Engineers in Civil Aviation with A, B, C, D & X licences should be employed by the Air Forces; and the Air Force should be fully represented on the examination boards and the certificates endorsed as "Acceptable to the Defence Services". (Para 72, Chapter I).

VII. General recommendations

For the successful expansion of research and training facilities in universities and special institutions, especially in regard to the various programmes recommended above the Government should immediately adopt the following special measures:—

(a) The existing handicaps in the matter of import of scientific equipment and apparatus for educational institutions should be removed and top priority given for such imports. The Government should also endeavour to secure from abroad through the official trade agencies whatever equipment the institutions concerned fail to obtain themselves. The Government should as far as possible also allow rebate on the import duty on scientific equipment.

(b) In order to augment the existing equipment resources for scientific institutions the Government should reconsider its present policy of disposal of surplus war materials of scientific value and adopt necessary measures to prevent the passing of such materials into the hands of private dealers and ensure that the materials are made available to educational and research institutions easily and as far as possible free of cost.

(c) In order to facilitate the training of additional workers in institutions and industrial concerns the Government should immediately evolve a suitable machinery for expediting building construction, especially at various training centres, and also provide necessary funds for the purpose. The following concrete steps may be favourably considered by the Government:—

(i) Construction of additional wings to the existing hostels in universities, research and technical institutions where the additional men are intended to be trained and the cost of such construction to be entirely borne by the Government.

(ii) Construction of residential buildings in factories where training is to be provided on the basis of 50 per cent. of the cost as interest free loan to the industrial concerns, the loan to be repaid to the Government in instalments and the buildings constructed to become the property of the concerns after a certain period. (Paras 73 to 75, Chapter I).

In order to overcome the great difficulties experienced by the Government in implementing most of their schemes for the improvement and expansion of research and training facilities, the Government should:—

(a) Leave it to the administrative department to decide as to how any particular scientific or technical post should be filled. The normal procedure of recruitment through the Federal Public Service Commission can be followed generally but in special cases at the discretion of the Administrative department, posts may be filled through negotiations with prospective candidates through the medium of a selection committee, with which it may be possible to associate the Federal Public Service Commission.

(b) Create Scientific Service at par in status and emoluments with administrative services, similar to that created in Great Britain.

(c) Improve the salary scales of teachers especially those engaged in technical education.

(d) Provide funds to enable the institution to send their experienced staff overseas to visit important centres of scientific and technical education and research.

(e) Institute a large number of scholarships for post-graduate and research training in institutions in India.

(f) Ask the administrative department to set up a Building Committee on which representatives of the C.P.W.D. and the Finance Department may sit together with departmental representatives and wherever necessary to entrust the department at its discretion to have their building planned and executed through the private agencies.

(g) Delegate a greater amount of power than at present to heads of educational and research institutions.

(h) Place at the disposal of the institutions the funds in the form of block grants to implement programmes approved by the Government. Normally, the head of the institution should have the authority as a matter of course, once the scheme has been approved and funds allotted, to take the action he considers most appropriate to achieve the desired result without delay.

(i) Decisions on technical matters should be arrived at in fullest consultation with the scientific and technical men at all stages. For any changes in technical proposals including policy, technical men of the department should be given an opportunity to represent their view point. (Para 77, Chapter I).

(The above includes the provision for departmental schemes, which have been accepted by Government, in principle).

PART II.

NOTES BY :—

Sir S. S. Bhatnagar.

Rai Bahadur A. N. Khosla.

Dr. J. N. Mukherjee.

Dr. K. C. K. E. Raja.

Dr. J. N. Ray.

Wing Commander H. Singh.

Dr. D N. Wadia.

Dr. S. R. Sen Gupta.

CHAPTER I.

Training of Personnel for Scientific and Industrial Research and for Industry

By

S. S. Bhatnagar

It is proposed to deal in the following with the measures that need to be given the highest priority for the training of personnel for scientific and industrial research and for the Industry. The kind of training contemplated may be brought under four general categories viz. (i) Higher research and to some extent advanced technological training in special institutions; (ii) research and perhaps education also leading to a post-graduate degree in Indian Universities; (iii) advanced training after the graduation stage and to some extent research also in industrial concerns; (iv) semi-advanced or foremanship training in industrial concerns after the diploma or a higher stage.

Training in special institutions.—The existing research institutions, which may be enabled to take up immediately the training of scientific workers are given in Appendix 'A' together with the subjects in which the institutions can impart training and the probable number of men, who may be trained in addition to the present strength. Since the type of training contemplated in these institutions is entirely different from that provided in regular educational institutions the best way of attaining the objective in view would be to provide research scholarships on a generous scale in these institutions. This measure will result in a large number of post-graduate students with suitable academic qualifications entering the institutions for further study and research in the several sciences and technologies. Incidentally, this would also give great impetus to the development of research in the country. In addition to scholarships adequate grants for the purchase of laboratory equipment, books and journals will have to be made to the institutions.

It may be mentioned here that in the immediate past, especially during the war years most of the special institutions and universities have greatly suffered in the matter of obtaining apparatus and other equipment, due to various disabilities such as for instance lack of funds, lack of priority for the import of equipment etc. These disabilities should be removed immediately if the institutions are to be enabled to increase their outturn of trained personnel. The import of equipment for any training institution should be given top priority and the government should endeavour to secure from abroad whatever equipment the institutions concerned fail to obtain by themselves.

The National Laboratories of the Council of Scientific and Industrial Research although belonging to the category of special institutions are different from those mentioned in Appendix 'A' in that the laboratories will soon constitute the single largest employer of scientific talent and hence provision will be made for the immediate training of such personnel as is required for the execution of the research programme of the laboratories. Besides, the work of the National Laboratories is highly diversified and cover a wide range of specialised subjects, and advanced training for the senior staff can in the initial stages be provided only in specialised research centres abroad. Such deputations are obviously different from the Overseas Training Scheme, which the Government has put up. The Council has provided for the advanced training of nearly 50 members of the senior staff of the laboratories abroad. At the same time provision can also be made immediately for the training of at least 15-20 research workers in the present laboratories of the Council (Physical and Chemical Sections located at Delhi, nucleus of the Fuel Research Institute at Dhanbad and the nucleus of the Central Glass and Ceramic Research Institute at Calcutta) in the following subjects: General Chemistry, Organic Chemistry with special reference to plant products, plastics, paints and

varnishes, Oils and Fats, Physical and Chemical Survey of Coal, Glass and Ceramics, Ultra-sonics, Wood Impregnation, Carbon Products, Producer gas fuels, Electro-chemistry etc.

This immediate out-turn of trained scientific workers can be increased further if the laboratory accommodation available in Delhi is also increased, since the Council has in its possession some facilities by way of equipment etc., which could be stretched to meet this urgent need. This particular scheme should be implemented without delay so that within the next 10-12 months we can have about 20 additional men, who can be fitted either in the projected National Laboratories or in Industry. This will supplement the trained scientific personnel coming out of other special institutions and universities.

Training in Universities.—Next to the scientific institutions mentioned, the universities constitute the most important training ground for the superior types of scientific and technical manpower. Whatever facilities, which we may have to extend to our universities for an immediate increase both in the out-turn and the usefulness of the trainees will be largely influenced by the fact that some of the universities do not have post-graduate research departments and those that do, do not possess the heavier and costlier types of equipment and apparatus which are necessary to train up men, who could engage in more advanced stages of research or could directly take on responsible jobs in Industry. What, therefore, needs to be done immediately is to strengthen the existing post-graduate departments especially in respect of equipment. At the same time, we should provide for a good number of post-graduate studentships in every university in order to attract promising young-men into the post-graduate departments. These urgent measures could only be applied for immediate fruitful results to only such of the existing universities as have post-graduate departments, which include research, and will help to fill in the existing gaps in the supply of trained personnel. As regards those universities, which have now proper post-graduate departments our approach to the problem will have to be different in that, these should be enabled to take immediate steps to create post-graduate departments, keeping primarily in view research in the basic and applied sciences. For this, grants will have to be made to the universities for the institution of professorships, readerships and other guiding staff for research, for the purchase of equipment and for the creation of a suitable number of scholarships. This measure will ensure an increased supply of men required in execution of the various developmental plans.

In Appendix 'B' is given a statement showing the existing facilities in various Indian Universities and other educational institutions for post-graduate research and training, the probable number of additional men who can be accommodated, provided the existing facilities are augmented as suggested above, the universities in which post-graduate departments and new courses of higher studies will have to be set up.

Training in Industry.—One of the means by which we may augment the existing facilities available in universities and special institutions on the industrial side is to tap the existing industries themselves. Many major industrial concerns in the country especially in such fields as Iron and Steel Metallurgy, constructional engineering, heavy chemicals and chemical industries, soaps, oils and fats, paints and varnishes, cement, sugar and alcohol have very good factory facilities to offer for both advanced and foremanship training of candidates. It is, however, to be noted that only a very limited number have any worthwhile research facilities. In the immediate future, therefore, training in industrial concerns will be confined mostly to the former type rather than to industrial research.

In Appendix 'C' is given a list of important industrial subjects together with the firms, which are capable of providing training facilities. It has not been possible at this moment to ascertain definitely what firms are willing to admit trainees and in what numbers. Whatever information is available in this respect is given in the appropriate columns in the list. Since, most of the industrial concerns regularly admit apprentices from universities and technical institutions in some strength or other it may be assumed that in the present scheme of training their co-operation would be forthcoming. However, some sort of legislative measure would be necessary to ensure that every industrial concern which has the necessary facilities does take in men for training. The Government should endeavour to secure facilities for at least 300 men for advanced training and for about 500 for foremanship training.

In addition, in every contract entered into by the government for the purchase of industrial machinery, plant and equipment from foreign and Indian firms there should be provision in the terms of purchase for the training of a suitable number of Indians in the workshops of the firms. This measure will help to open up another useful line of training in Industry.

It may be mentioned here that the various concerns, such as the railway workshops and laboratories, ordnance factories and high explosive factories etc. which are under the direct administration and control of the government should be asked to take in men for training to their utmost capacity, so that these could supplement the facilities available in private industrial concerns. The Railway workshops and laboratories constitute in fact an ideal training centre for scientific workers in all problems relating to railways and we should not fail to utilise the existing facilities for such training of men, who would be required in large numbers to man the railways in the near future. There are at present six State Railway Laboratories and 10 Workshops in India where all kinds of chemical, metallurgical and allied problems are dealt with. For want of efficient technical advice and help, the scientific officers incharge of the laboratories are now kept busy mainly with routine analytical work although these men are competent to undertake research work on any railway scientific problem and also to train up others in the line. In order, therefore, to utilise fully the facilities available in our State railways, both in regard to men and materials for purposes of giving impetus to railway scientific research and the training of a scheme of Railway Scientific Research should be taken up immediately. A Chief Railway Scientific Officer or Director of Railway Scientific Research should be appointed to work out the details of the scheme and carry it out. In its essentials, however, the scheme should envisage research and training on the following problems: (1) Heat treatment of metals; (2) Corrosion and wear of metals; (3) Boiler feed metals; (4) White Metal and other non-ferrous alloys; (5) Foundry Moulding Sands; (6) Refractory Materials; (7) Oils, Paints and Varnishes; (8) Quenching Oils for tempering; (9) Reclamation of Oils; (10) Hot boxes; (11) Oil-less bearings; (12) Reclamation of Metals; (13) White Metalling procedure; (14) Fatigue failure of Metals; (15) Welding of rails; (16) Economy on coal consumption; (17) Coal-dust briquetting; (18) High duty cast iron; (19) Manufacture of Malleable cast iron; (20) Manufacture of Steel.

An eminent and experienced railway scientist should be selected for the post of Director for Railway Scientific Research in consultation with the Council of Scientific and Industrial Research and in addition four qualified Deputy Directors to be incharge of the following four sections: (a) Fuels; (b) Metals; (c) Boiler water; (d) Lubricants, Oils and Paints should also be appointed.

This scheme of railway research on the Indian Railways can easily take in 200 scientific workers, who would be suitably trained in different railway laboratories and workshops. No additional expenditure for buildings or for

housing the training centres would be required as these can be conveniently done by individual railways as and when required by the Director of Railway Research.

Training in industrial concerns could be best provided by selecting suitable men and assigning them to the various factories. The selected men should be given attractive stipends and should be placed under the top technical executives of the concerns—who should be well qualified and experienced in their respective fields—so that they may receive the best of attention and training. Advanced technical training should as far practicable include research training also in the factories, which have facilities for such work. After the necessary training, most of these men will fill the existing gaps in respect of technical personnel required for manning the industries and in suitable cases for technological research in the research laboratories of the Council of Scientific and Industrial Research and the Industry

Financial aspects of the scheme.—Both capital and recurring grants would be required to give effect to the recommendations made in the present scheme of training of scientific and technical personnel. The former would largely be in the form of studentships or scholarships for the trainees; and the latter for the purchase of additional equipment etc., especially in the post-graduate departments of universities. It may be proposed that the value of scholarships in universities and special institutions should be about Rs. 100 p.m. and in industrial concerns Rs. 100 and Rs. 75 for advanced and foremanships training, respectively. The capital grant that is to be made to the universities depends on the actual needs of the universities in the immediate future to provide training facilities for additional men and will vary from university to university since some universities have to start post-graduate departments on the requisite scale. It may, however, be proposed that the universities which have to start post-graduate departments should receive a lump sum grant of Rs. 5 lakhs and a proportionate recurring grant for the creation of professorships, readerships and other tutorial staff and to meet their expenses. As regards the universities which have already research departments, a general equipment grant of Rs. 2 lakhs for each university and a recurring grant of 20 per cent. of the university's present annual expenditure may be made. All the grants proposed will be in addition to the scholarships and studentships which the government has to institute. Since many of the industrial concerns are already in a favourable position in respect of training facilities large sums of money, it is expected, would not be required for capital or recurring expenditure in these places.

The following statement indicates an approximate estimate of the grant required during the next 12 months for this part of the training programme.

A. Recurring.

	Rs.
1. Scholarships for research training and advanced study in universities and special institutions (Non-Government) Ttoal No. 250; Value Rs. 100 each	3 lakhs.
2. Scholarships for advanced training in industrial concerns: Total No. 300; value Rs. 100 each	3·6 lakhs.
3. Scholarships for foremanship training in industrial concerns: Total No. 500; value Rs. 75 each	4·5 lakhs.
4. Creation of professorships, Readerships, etc. in universities 20 Readerships, 20 Professorships, and 40 Lecturerships	5 lakhs.
5. Recurring expenditure miscellaneous for universities and research institutions	8·00 lakhs.
6. Research Scholarships for training in the laboratories of the Council of Scientific & Industrial Research; Total No. 20; value Rs. 100 each and recurring expenditure	0·35 lakhs.
7. Scholarships for Railway Scientific Research Scheme. Total No. 200; value Rs. 100	2·4 lakhs.
8. Director of Railway Research on Rs. 2,500 p.m. & 4 Deputy Directors each on Rs. 1,500 p.m.	1·0 lakhs.
Total	27·85 lakhs.

B. Capital.

1. Capital grant to Universities for starting post-graduate departments 6 Universities Rs. 5 lakhs each	30 lakhs.
2. Capital grant to existing post-graduate departments of Universities 9 Universities, Rs. 2 lakhs each	18 lakhs.
3. Capital grant to research institutions (Non—Govt.) 7 institutions	12 lakhs.
Total	60 lakhs.
Capital grant	60 lakhs.
Recurring grant	27·87 lakhs.

NOTE.—(As regards hostel accommodation for the additional trainees in Universities and special institutions, and also buildings for the expansion of University post-graduate departments it has been found that this need could be met from the funds (about Rs. 75 lakhs) proposed to be spent by the Education Department in the immediate future on a general expansion and strengthening of the existing Universities and other educational institutions. The question of accommodation for trainees in industry, however, should be taken up with industrial concerns, individually and satisfactory arrangement arrived at).

Other Special Measures.—After an extensive survey of the existing facilities in the country the Industrial Research Planning Committee of the Council of Scientific and Industrial Research has made some farreaching recommendations for the organisation of scientific and industrial research in India on the basis of a 5 year plan. Of these, the following four recommendations are of special significance in the present context of research training.

(1) Setting up of a net-work of National Research Laboratories.

(2) Block grant of Rs. 6 crores from the Central Government (spread over a period of 5 years) for the establishment of National Laboratories and for providing funds to universities and special institutions for research in all sciences and technologies.

(3) Annual recurring grant of Rs. 1 crore from the government for ensuring the continuity of research activities on a progressive scale.

(4) Levy of a statutory cess (1/16 of 1 per cent) on Industry on the basis of industrial production or as a small surcharge on income tax so as to realise at least Rs. 1 crore for supplementing the grant from the Government for research.

In-as-much as the above recommendations will give immediate impetus not only to the expansion of facilities in the country for scientific and industrial research but also to the out-turn of scientific manpower they should be given effect to. The question of levy of cess on Industry has been under the consideration of the Department of Industries and Supplies but urgent action in the matter should be initiated. The Council of Scientific and Industrial Research being the Central Organisation responsible for the development of research in the country, should be provided with the capital grant of Rs 6 crores (spread over 5 years) and the recurring grant of Rs. 1 crore in addition to the proceeds of the cess to carry out its various plans for research development. In addition to the establishment of new laboratories and the financing of research departments of universities and other institutions these plans include some of the essential features of research training envisaged in this scheme. The present scheme in its entirety can also be adopted and carried out, expeditiously by the Council in view of the fact that the Council and its Advisory bodies constitute the best existing machinery for the implementation of the proposals of the training scheme. In the event of the decision to give effect to the recommendations of the Industrial Research Planning Committee along the above lines no separate grants (as shown in pp. 7-8) apart from those

recommended by the Industrial Research Planning Committee would be necessary.

Summary of recommendations.—(1) For an immediate increase in the supply of scientific manpower it is necessary to tap the existing universities, special institutions and industry by creating adequate facilities in these places for advanced research and training.

(2) The target of increase under the existing circumstances should be at least 250 trained men for scientific and industrial research, 500 men (advanced cadre) for the manning of the industries including the state railways and also for industrial research and 500 men (foremanship cadre) for the industry in the next 12 months.

(3) Such facilities as are to be created for the above purpose, should largely be in the form of grants to universities and special institutions for instituting post-graduate research scholarships or studentships on a generous scale, purchase of equipment, opening of post-graduate research departments in the universities, which do not have any at present, and for the creation of Professorships and Readerships in some of the universities.

(4) The government should sanction a capital grant of Rs. 60 lakhs and a recurring grant of Rs. 27·87 for this training scheme.

(5) The recommendations of the Industrial Research Planning Committee relating to a block grant of Rs. 6 crores (spread over a period of 5 years) and a recurring grant of Rs. 2 crores for the organisation of scientific research should be implemented and the grants placed at the disposal of the Council of Scientific and Industrial Research for the immediate purpose of expanding research and training facilities in the country. If this is done, no separate grant as recommended in (4) need be made since the Council of Scientific and Industrial Research would then be in a position to implement the main features of the present scheme.

(6). Some kind of legislative measure should be enforced whereby it becomes incumbent on every established industrial concern in the country to provide for technical training to qualified young men, notwithstanding whether the personnel thus trained would be required by the concern or not. Government should also arrange for expanded facilities for the industrial training in such places as Railway Workshops, Ordnance and Explosives factories, and other concerns, which are under their direct control.

(7) The import of equipment for any research or educational institution should be given the highest priority and the government should endeavour to secure from abroad whatever equipment the institutions concerned fail to obtain themselves.

(8) A scheme of railway research and training as outlined in this report should be taken up in order to provide facilities for the immediate training of at least 200 workers in the existing railway workshops and laboratories.

APPENDIX 'A'

Institution	Subjects	Additional number of workers who may be trained
1. Indian Institute of Science, Bangalore.	General and Applied Chemistry, Industrial Fermentation, Bio-chemistry, Organic Chemistry with particular reference to Pharmaceuticals and Drugs, Physics, Electronics, Chemical Engineering, Internal Combustion Engines, Communication and Electrical Engineering, Aeronautical Engineering and Metallurgy.	30
2. Bose Research Institute, Calcutta.	Nuclear Physics, X-rays and Ultrasonics, Plant and Animal Physiology, Biophysics, Biochemistry, Anthropology and Racial Biology.	13
3. Tata Institute of Fundamental Research, Bombay.	Nuclear Physics, Cosmic rays and Theoretical Physics.	4
4. Forest Research Institute, Dehra Dun.	Wood technology, Wood Chemistry, Paper and Pulp, Minor Forest Products, Botany, Biochemistry.	12
5. Imperial Dairy Research Institute, Bangalore.	Dairy and Dairy Chemistry.	8
6. Haffkine Institute, Bombay .	Sera, Vaccines, Anti-toxins, Pharmaceuticals and Drugs, Antibiotics, Biochemistry, Pharmacology, Organic Chemistry, Bacteriology.	10
7. Biochemical Standardisation Laboratory.	Biological evaluation, Biochemistry, Pharmacology.	5
8. Nutrition Research Institute, Coonoor and Shillong.	Nutrition, Biochemistry	8
9. Cotton Technological Laboratory, Matunga.	Physics and Chemistry of Cellulose and Textile fibres.	5
10. Geological Survey of India .	Geophysical prospecting Mineralogy, Mineral analysis.	12
11. Indian Association for the Cultivation of Science.	Crystallography, Magnetism, X-rays, Spectroscopy.	8
12. Provincial Industrial Research Laboratories.	Industrial Research	5
13. Lac Research Institute, Ranchi.	Lac and Lac Products	5
14. Jute Research Institute .	Jute and Jute Products	5
15. Laboratory of the Indian Academy of Sciences	Mineralogy, Spectroscopy, Crystallography .	3
16. Ordnance Laboratories .	Ordnance and Military Stores, Testing and Research.	20
17. Directorate General of Observatories (at various places).	Meteorology, Physics of the Upper Atmosphere. Solar Physics and Seismology.	25
18. All-India Radio . . .	Communication Engineering	10
19. Govt. Test House . .	Testing of raw materials and finished products	15
20. Sericultural Research Station, Kollegal and Government Silk Institute, Bhagalpur.	Sericulture and silk spinning, weaving and dyeing	5
21. Metallurgical Inspectorate, Tatanagar.	Metallurgical Research and Testing . .	5
22. Inspectorate of Military Explosives.	Research in plastics, Testing and Explosives and other defence chemicals.	4
23. Survey of India . . .	Trigonometrical, magnetic and other surveys, Geodesy.	10
24. Mathematical Instruments Office.	Mathematical, and Physical Instruments and Accessories.	5
25. Civil Aviation Directorate .	Communication Engineering	10
26. Posts and Telegraphs Dept. Workshops and Laboratories	Tele-communication	20
27. Zoological Survey . .	Marine Biology, Museum	5

1	2	3
28. Botanical Survey. . .	Botanical Museum, Botanical Gardens and Cinchona and other alkaloid-bearing plant cultivation.	6
29. Central Waterways, Irrigation and Navigation Commission and Waterways experimental Station at Poona.	Dam construction, Power Projects Irrigation, Navigation, Hydro-dynamics.	12
30. Public Works Department of Central and Provincial Governments.	Structural, Highway and Irrigation, Engineering and Design.	15

APPENDIX 'B'

University or Institution	Subjects of post-graduate research and advanced study	Number of additional men who may be admitted	Remarks
1. Calcutta University (Univ. College of Science & Technology Presidency College).	Physics, Chemistry, Botany, Zoology Psychology, Physiology, Bio-Chemistry, Geology, Nuclear Physics and Electronics and Applied Physics and Chemistry, Mathematics.	25	Good facilities available for taking up immediate training. Can admit a good number of workers if additional equipment and scholarships are made available.
2. Bombay University (Dept. of Chemical Technology and Royal Inst. of Science).	Applied Chemistry, Textile, Chemistry, Chemical Engineering, Foods, Drugs and Pharmaceuticals, Dyestuffs.	15	Good facilities are available and are being expanded. Can take up a considerable number of workers if additional equipment and scholarships are made available.
3. Madras University (University Research Labs., Presidency College & College of Technology).	Organic Chemistry, Biochemistry, Botany, and Zoology, Leather Chemistry and Technology, Mathematics.	8	Facilities for diversified post-graduate research and training not available. Belong to the second category of institutions, which need encouragement for opening up proper post-graduate departments in various branches specially in technology.
4. Andhra University (Univ. College of Science and Technology).	Physics, Chemistry, Natural Sciences and Chemical Technology.	10	Special facilities available for advanced study in Chemical Technology and Research in Plant Products. Can turn out useful results if funds are made available for the strengthening of the existing departments.
5. Nagpur University (Lakshminarayan Inst. of Technology).	Chemical Enginneering and Technology.	..	Facilities mostly for training post-graduate students in Industrial Chemistry and Chemical Engineering available. Need equipment and scholarships for immediate work and also funds for opening post-graduate departments.
6. Benares Hindu University . .	Physics, Chemistry, Mathematics, Zoology, Geology, Industrial Chemistry, Chemical Engineering, Ceramics, Glass Pharmaceuticals, Mining and Metallurgy.	20	Facilities available for research in fundamental and applied sciences as also for advanced study. Need equipment and scholarships for increasing the out turn of personnel.
7. Delhi University. . .	Physics and Chemistry.	4	Limited facilities for post-graduate research and training but can avail of the facilities available in the C. S. I. R. laboratories. Need funds for opening proper post-graduate deptts. Some facilities for post-graduates.

University or Institution	Subjects of post-graduate research and advanced study	Number of additional men who may be admitted	Remarks
8. Lucknow University	Physics, Chemistry, Botany, Zoology, and Mathematics.	6	Some facilities for post-graduate research in fundamental sciences especially in paleobotany exist. For the strengthening of the post-graduate departments the university needs considerable sums for equipment scholarships and also for some Chairs.
9. Patna University	Physics and Chemistry.	5	Only limited facilities exist for post-graduate research. The university needs grants for opening up post-graduate departments, especially in technology since it has to meet the growing needs of Bihar.
10. Allahabad University	Physics, Chemistry, Botany & Zoology	6	The University has fairly well-established post-graduate departments in Physics and Chemistry but lack proper tutional staff to guide in research. First requirement is in respect of staff and scholarships and also better equipment. Post-graduate departments in applied sciences will have to be opened.
11. Annamalai University	Physics, Chemistry, Botany and Zoology	4	Although the University has started post-graduate departments in some of the sciences it has few facilities to offer for advanced research and training. Hence primary requirement is in respect of equipment, scholarships and to some extent staff. The university also needs encouragement to open post-graduate departments in applied sciences.
12. Agra University (affiliated colleges)	Physics and Chemistry	2	It is only an affiliating university and has no proper post-graduate dept. Hence belongs to the category of universities which have to be encouraged to establish post-graduate departments. But the affiliated colleges can perhaps accommodate the number indicated for research.
13. Aligarh University	Physics and Chemistry, Botany, Zoology and Mathematics.	10	The University's primary requirements for advanced research and training are in respect of equipment and scholarships. It also needs considerable support for opening post-graduate departments in technological sciences.
14. Punjab University	Physics, Chemistry, Botany, Zoology and Chemical technology.	10	The Univeristy's primary requirements for advanced research and training are in respect of equipment and scholarships.
15. Dacca University	Physics, Chemistry, Mathematics and Biological Sciences.	8	

(Universities of Indian States are not included in the above list).

Educational Institutions not affiliated to any University.

16. Bengal Tanning Institute.	Leather, Chemistry and Technology	5	Facilities exist for research and advanced study in Leather, Chemistry and Technology.
17. Leather Trades Institute, Madras.	Leather, Chemistry and Technology	5	Facilities exist for research and study in Leather Technology.
18. Harcourt Butler Technological Institute.	Oils and fats and general Chemical Technology.	4	Some facilities exist for technological research in soaps, oils, fats and applied chemistry.
19. Imperial Institute of Sugar Technology.	Sugar Chemistry, Sugar Technology and Sugar Engineering, Fermentation, Chemistry and Technology	4	Facilities exist for Technological research and training in problems of sugar and fermentation industries.
20. Kerala Soap Institute.	Soaps, oils and fats and essential oils.	3	Facilities exist for training and research in the Technology of oils, fats and soaps and also cosmetics.
21. Indian School of Mines, Dhanbad.	Geology and Mining, problems connected with coal.	5	Facilities exist for research and training in problems connected with coal, especially coal washing.

APPENDIX 'C'

Subject.	Name of Concern.	Firm willing to take in trainees.	Probable No.	Remarks.
1. *Metallurgy and Engineering.*				
(*a*) Iron and Steel .	(1) Tatas; (2) Indian Iron and Steel Co.; (3) SCOB; (4) Kumardhubi Works; (5) Bharatia Steel Works; (6) Mukand Steel Rolling Mills; (7) National Iron and Steel Works; (8) Ordnance Factories; (9) Railway Workshops; (10) Mysore Iron and Steel Works; (11). J. K. Steel and Iron Co; (12) Indian Rolling Mills, Negapatam.	(1), (8) & (10) and (9) if the Government allows.	20	Almost all the firms have very well equipped works and Control laboratory facilities for advanced training in Iron and Steel metallurgy. Definite information regarding willingness to admit trainees is available only in respect of firms 1 and 10. But, all are likely to provide facilities for training in which case the number will be quite considerable. The Tatas have also good facilities for metallurgical research.
(*b*) Refractories .	(1) Burn & Co.; (2) Reliance Firebricks; (3) Kumardhubi Works; (4) Bihar Firebricks & Pottery Co.; (5) Tatas; (6) Himalaya Potteries.	(5) . . .	5	Firms (1), (3) and (5) have very good facilities for training and all are likely to admit trainees.
(*c*) Associated Industries.	(1) Tinplate Co. of India; (2) Metal Box Co. of India; (3) Indian Wire and Steel Products; (4) Wire Nails of India.	No information .	..	
(*d*) Non-ferrous Metals.	(1) Indian Copper Corporation; (2) Indian Standard Metal Wks.; (3) Kamani Wks.; (4) India Rolling Mills; (5) Jayant Metal Manufacturing Co. Aligarh; (6) Indian Smelting and Refining Co.; (7) Indian Aluminium Co.; (8) Aluminium Corporation of India; (9) Jeevan Lal & Co.	(1) . . .	5	(7) and (8) are aluminium manufacturing concerns and have good facilities to offer for advanced training in electro-metallurgy.
(*e*) Engineering Industries.	(1) Jessops; (2) India Machinery Co.; (3) Britannia Engineering Co.; (4) Copper Engineering Co.; (5) Kirloskar Co.; (6) Maya Engineering Co.; (7) Hind Machines.	..	..	Excepting firm (24) who have agreed, no definite information is available as regards the firms which are willing to take trainees. But since most of

	(8) Investa Machine Tool Co.; (9) Jay Engineering Co.; (10) S. L. Dutta and Co.; (11) P. S. G. & Co. Coimbatore; (12) Avery & Co.; (13) Bharat Eng. & Weighing Scale Syndicate; (14) Taxmaco; (15) Garlick & Co.; (16) Joyti Ltd., (17) Feather Stone Eng. Co.; (18) Cooper, Connolly & Califford Co.; (19) Braithwaite & Co.; (20) Martin & Co.; (21) Saran Eng. Co.; (22) Ordnance Factories & Railway Workshops; (23) Ford and General Motors Co.; (Body building and assembling); (24) Birla Cycle Manufacturing Co.			the concerns have good workshop facilities and since many of them admit apprentices from universities it may be assumed that they might provide facilities for advance technological training. It may also be assumed that at least 50 candidates for advance training and 100 for foremanship training may be provided for in these firms. Some of them, especially Messrs. Cooper Engineering Co., Kirloskar Co., have facilities in specialised lines like internal combustion engines, pumps, etc.
(f) Electrical Industries.	(1) Bengal Lamps; (2) Mysore Lamps; (3) Bharat Lamp and Electric Wks.; (4) Bijli Products; (5) Calcutta Electric Lamp Works; (6) Electric Lamp Manufacturing Co. of India; (7) India Electric Works; (8) Greeves Cotton, Crompton & Parkinson; (9) Calcutta Electrical Mfg. Co.; (10) Kaycee Industries; (11) Government Electric Factory, Bangalore; (12) Bestolite Co.; (13) Estrella Products; (14) Standard Batteries; (15)Bharat Batteries; (16) Chloride Electrical Storage Co.; (17) Associated Elec. Mfg. Co.; (18) AMCO Ltd.; (19) Metropole Works; (20) National Insulated Cable Co. of India; (21) Indian Cable Co.; (22 Indian Conduit Inustries; (23) Indian Hume Pipe Co.	....	.....	The above remarks hold good in general.
(g) Ship building and Marine Engineering.	(1) Scindia Steam Navigatign Co.; (2) Gordon Reach Works; (3) India Navigation and Railway Co.; (4) Port Eng. Works; (5) Hooghly Dooking & Eng. Co.; (6) Alcox Ashdown Co., Bombay; (7) Ahmadia Ship-yard; (8) Martin & Co.	.....	.....	No definite information. But it may be possible to obtain facilities for the training of at least 15 candidates.

Subject.	Name of Concern.	Firm willing to take in trainees.	Probable No.	Remarks.
(*h*) Air-craft . . .	(1) Hindustan Aircraft Co. . . .	.....	...	Since the firm is primarily government controlled there may not be any difficulty in admitting trainees. The factory is only for assembling, body building and rapairing purposes and about 20 people may be trained in these fields.
(*i*) Scientific stores. .	(1) P. R. & Sons; (2) Lawrence and Mayo; (3) Balance Works, Benares; (4) Mathematical Instruments Office; (5) Associated Instruments Mfg. Ltd.; (6) Adair Dutt; (7) SICO ; (8) Andhra Scientific Works; (9) Hargolal & Sons; (10) Raj-der-Kar; (11) Scientific and Industrial Equipment Co.	(9), (10) and (11)	6	It is likely that (3), (7), (8) and some others also may provide facilities for training. (4) is a government organisation and should be able to admit 2 workers.
2. Coking and Coal Carboni ation and wood and Coals tar Distillation.	(1) Tata Iron & Steel Co.; (2) Beraree Coke Co.; (3) Shalimar Tar Products; (4) Oriental Gas Supply Co.; (5) Mysore Iron & Steel Co.; (6) Government Coking Plants.	(1) and (5)	.	Since (6) is under government control, trainees may be admitted.
3. Heavy Chemicals, Chemical Industries, Pharmaceuticals & Drugs.	(1) Tata Chemicals; (2) Bengal Chemicals & Pharmaceuticals; (3) Mettur Chemicals; (4) Travancore Chemicals & Fertilisers; (5) Eastern Chemicals Co; (6) Pioneer Magnesia Works; (7) Chemicals Corporation of India; (8) Contact Acid & Chemical Co.; (9) D. C. M. Chemical Works; (10) Cordite & High Explosives Factories; (11) CIPLA; (12) Calchemico; (13) Zandu Chemical & Pharmaceutical Works; (14) Standard Drug Co.; (15) Industrial & Testing Laboratory, Bangalore; (16) Alembic Chemicals; (17) Sarabhai Chemicals; (18) Smith Stanistreet Co; (19) Alpha Chemicals; (20) Standard Pharmaceutical Co.; (21) Parry & Co; (22) Mysore Chemicals & Fertilisers; (23) Phoenix Chemical Works; (24) Birla Bros; (25) Shambhu Nath & Sons; (26) Indian Iron & Steel	(1), (3), (7) and (8)	15	The other concerns also might admit trainees.

	Co ; (27) D. Waldie & Co ; (28) Cawnpore Chemical Works ; (29) Dharamsi & Co., Bombay.			
4. Soaps & Cosmetics.	(1) Tata Oil Mills ; (2) Lever Bros. ; (3) Kerala Soap Works ; (4) Godrej Soap Co ; (5) Swastik Oil Mills ; (6) Modi Industries ; (7) D. C. M. Soap Works; (8) Bengal Chemical & Pharmaceutical Works ; (9) Calchemico ; (10) Mysore Soap Factory and many other concerns.	(1), (3), (7) and (8)	15	The other concerns also might admit trainees.
5. Textiles	All affiliates of Indian Textile Manufacturers Association and other major textile Mills.	.....	...	Although no definite information is available ragarding the firms, which are willing to provide facilities for advanced training in textile chemistry & engineering most of the Mills usually admit apprentices in considerable numbers and it may be assumed, these will agree to take in more men under the present scheme. Besides, the Indian Textile Manufacturers Association has established a research association with plans for extensive research laboratories. It may also be expected that at least about 100 additional men may be provided for in the existing Mills.
6. Leather & Leather Products.	(1) Cawnpore Tanneries ; (2) Chrome Leather Co ; (3) Bata Co ; (4) Flex Co ; (5) Bengal Tanneries ; (6) North-West Tanneries ; (7) Gordon Woodroffe Co. Madras ; (8) Mysore Chrome Tanning Co ; (9) Cooper Allen & Co ; (10) The Eastern Tanneries & many others, big and small.	....	.....	No definite information is available, but it is likely that provision can be made in the bigger firms for advanced training in tanning and allied fields. About 25 men may be thus accommodated.
7. Paints & Varnishes, Rosin and Turpentine.	(1) Shalimar ; (2) Jenson & Nicholson ; (3) Constituents of IPMA ; (4) Good Lass Wall ; (5) Hadfields ; (6) Hoyle, Robson, Barnett & Co.; (7) D. Waldie & Co.; (8) Balmer Lawrie & Co.; (9) Macfarlane & Co; (10) Wilkinson Heywood & Clark & Co ; (11) Robert Kearsley & Co ; (12) Lyall Marshall & Co ; (13) Jay Engineering Works ; (14) Spence Ltd.; (15) Robert Ingham Clark ; (16) Jello Rosin Co.	....	.....	No definite information is available, but most of the firms have good laboratory and factory facilities to offer for advance training and can on the whole provide for at least 35 trainees.

Subject.	Name of Concern.	Firm willing to take in trainees.	Probable No.	Remarks.
8. Paper . . .	(1) Titaghur Paper Co; (2) Shrigopal Paper Mills; (3) Mysore Paper Mills; (4) Upper India Cooper Paper Mills Co; and constituents of Indian Paper Manufacturers' Association.	(3) & (4) . .	8—10	The rest of the firms are likely to provide training facilities.
9. Sugar and Alcohol	Important sugar factories in the country.	....	..	No definite information is available, but it is likely that most of them will offer facilities for training to the extent of about 50 candidates on the whole.
10. Glass and Ceramics .	(1) Bengal Potteries ; (2) Gwalior Potteries; (3) Mysore Porcelain Factory (4) U. P. Glass Works; (5) Sodepur Glass Works; (6) Ogale Glass Works; (7) Ganga Glass Works; (8) Capital Glass Works; (9) Kaycee Glass Works; (10) Scientific Indian Glass Works; and several others big and small in U. P., Calcutta and elsewhere.	....	..	No definite information is available, but it is likely that some of them will admit trainees. It is, however, to be noted that most of the glass companies are working along obsolete lines and, therefore, can offer few facilities for advanced training in glass technology.
11. Cement . . .	Cement Companies of Dalmia; and the constituents of Assoiated Cement Companies.	....	..	No definite information is available but since most of them usually admit apprentices, can now offer facilities for advanced training for at least 20 men under this scheme.
12. Rubber . . .	Dunlop Rubber Co.; Firestone Tyre and Rubber Co.; Bata Shoe Co.; Bengal Water-Proof Co; A. K Sarkar and Co.; Travancore Rubber Works; Indian Rubber Manufactures.	....	..	No definite information is available but it is likely that most of the firms will admit men for training.
13. Mineral Oil & Refining	Attock Oil Co., Assam Oil Co. . .	....	..	The above remarks hold good.
14. Manganese & Copper Mining.	Four firms	....	..	The firms are willing to admit trainees but the number is not yet known.

CHAPTER II

Programme for provision of facilities for education, training and research for engineering personnel which can be initiated within the next six months.

BY

A. N. KHOSLA

The two main handicaps at present are lack of equipment and shortage of professors. The shortage of college and hostel accommodation is yet another handicap but of lesser significance.

2. We have to consider engineering training under three categories:

(a) Engineering officers.

(b) Engineering subordinates and draftsmen.

(c) Technicians.

The number required under each of the categories (b) and (c) will be three to four times that under category (a). A balanced scheme of training must provide for training to the required extent under each category.

3. It will take some time before our long term plans can be implemented. In the interval—and this is the period of emergency—there is urgent need for increasing the output of technical personnel from colleges and schools. These needs can be met in the following ways without lowering efficiency.

(i) The course of training at the engineering colleges and schools should be reduced by curtailing vacations and introducing additional hours of teaching. This was followed with success at the Thomason Civil Engineering College, Roorkee, as a war measure.

(ii) Double shifts and evening classes should be introduced in colleges, schools and research laboratories, wherever possible. Professors should be required to put in more hours of work during this period of emergency and given additional pay for this additional work.

It may be argued that the professors, lecturers and demonstrators have already too many hours to put in during the week with the result that they have little time to devote to advanced studies, or research. It must, however, be recognised that, as conditions stand at present in India, only a very limited number of professors and lecturers care to devote time to advanced studies or to carry out research. Most of them find these spare hours hanging heavily on them which they try to fill up with "bridge" and other futile social functions. In the nation's hour of need, these superfluities must go, spare hours put to useful work and the teaching staff asked to devote more time to teaching work and train more students. Those among them who are genuinely desirous of pursuing advanced studies and research should be given full opportunity to do so. When the emergency is over more and more professors will have more and more free time for research and advanced studies.

It is pointed out that while the preparation of a lecture takes some considerable time, the delivering of the same lecture to two classes instead of one will not take more than an additional hour or so. In other words with a few additional hours of work per week on the part of each professor a large number of additional students can be trained. With the arrangement of double shifts, if adequate additional teaching staff can be made available, the same accommodation and equipment will suffice for teaching the additional number of students. In this way the out-put of students can be considerably increased if not actually doubled without much additional cost. High standards must, however, be maintained at all times and quality must not be sacrificed for quantity.

(iii) Engineers in Government and other services should be encouraged and, where necessary, required to devote some of their time to delivering specialist lectures in the engineering colleges and schools in subjects in which they have special knowledge.

The Heads of the Departments or Organisations concerned should nominate suitable officers and subordinates for the purpose, each one of whom should be given a suitable honorarium for this additional work.

For instance, officers in various engineering services, namely, irrigation, hydraulics, buildings and roads, railways, water supply, agriculture, electrical, mechanical, aeronautical, chemical, industry, etc., should be called upon to deliver a series of special lectures in these subjects, the basic ground work for which will remain the concern of the regular college professors and lecturers. This will relieve strain on the college professors and set some of their time free for training additional students or for research. To the students it will bring the benefit of latest ideas and a knowledge and appreciation of the up-to-date developments in the various fields of engineering activity.

Similar remarks would apply to the Research Officers and Research Assistants serving in the various Government and other Research Organisations, located within reasonable distance of the engineering institutions.

(iv) Government should make arrangement in the various Government. Departments, Research Stations and Industrial Undertakings, for the compulsory training of students at various stages of their career in the colleges and schools for a period of one year after they qualify. The Departments and Organisations concerned should be required to give special attention to the training of these students as practical training is of the utmost importance both to the candidates and the Departments and Organisations in which they are to serve. All such trainees should be given a stipend during the period of training. Quarterly or six-monthly reports on the work of these trainees should be submitted by the training officers to the Heads of Departments of Government or other Organisations. At the end of the training period, a copy of the final training report on each trainee should be sent to the Principal of the College concerned.

(v) To save time on preliminaries in Technical Institutions, the many Arts and Science Colleges and schools may be encouraged to give a certain amount of technical and vocational bias in their scheme of education.

For instance, in the high schools the curriculum in the Senior classes may include subjects such as mensuration, drawing, elements of mechanics, surveying, etc., and some vocational training such as masonry, carpentry, smithy, etc. Similar technical and vocational work including radio science and practice should be introduced in the intermediate and degree classes.

(vi) In order to meet the greater demand of engineering subordinates a greater number of engineering schools should be opened. Rapid progress in this direction should be possible by adding engineering classes to the many Arts and Science Colleges spread all over the country. Common subjects like Mathematics, Chemistry, Physics, etc., the Engineering students could read with the Science students. For technical subjects they may have separate lectures and separate teachers should be employed for the purpose. This will very considerably reduce the number of additional teachers and the amount of additional equipment required for the purpose. Successful experiment on these lines was carried out for many years in the D.A.V. College, Lahore.

(vii) A new engineering college and at least one engineering school should be set up in East Punjab at Amritsar, Jullundur, Ludhiana or Ambala. But until such time as this can be done, the Thomason Civil Engineering College

should admit the required number of students from the Punjab. Similarly, a new engineering college should be set up in East Bengal.

(viii) The Jadavpur College at Calcutta should be expanded.

(ix) Government should take over certain private engineering schools and with suitable additional staff and improvements in equipments and accommodation arrange to train engineering subordinates on well established standards.

(x) In order to maintain uniform standards of teaching throughout the country the All-India Council of Technical Education specify the minimum equipment required for institutions of various categories. Further to make sure that the out-put of students is not increased at cost of efficiency, outside examiners should have a hand in the college final examinations.

(xii) All Engineering Institutions in the country should be open to candidates from all over India, irrespective of the province of origin of the candidate or the province of location of the Institution.

Students from India can seek admission into any of the British, American or European Universities but in India students from one province are debarred from seeking admission into the Engineering Colleges and Schools located in any other Province. This practice is against the best interest of the country, as apart from engendering provincial exclusiveness, it leads to non-uniformity of teaching standards and prevents the impact of talent from different provinces so necessary to bring out the best in our young men.

(xiii) The four regional Institutions on the model of the Massachussetts Institute of Technology should be set up with the least possible delay.

(xiv) The remuneration of professors should be given the most careful consideration and must be at par with other services in respect of pay scales and prospects. If we want to maintain high standards in teaching and aim at turning out high class students, we must have the best men as professors.

4. I am making no special recommendations for immediate improvement in research facilities, as in the Centre as well as in many Provinces and States large Engineering Research Institutions are already in the course of being set up. Because of the difficulty of obtaining adequate equipment, this work cannot be appreciably accelerated. These research stations will deal with all matters relating to hydraulics, navigation, hydro-electric power development, buildings, roads, soils, materials of construction, geology, seismology, hydrology and various other subjects.

CHAPTER III

Measures which can be implemented during the next six months for speeding up education, training and research in agriculture and allied subjects

By J. N. Mukherji

The Sub-Committee of the Scientific Man Power Committee has been asked to suggest measures which should be put into immediate operation with a view to achieving:—

(a) the immediate improvement and expansion of facilities for scientific and technical training in Indian Universities and special institutions, and

(b) the promotion and development of scientific and technical research.

Since scientific and technical training and research are closely linked, it has been found convenient to treat them together.

In considering what should be done, we must first have some idea as to the existing facilities and the annual output of trained men in the different branches of agricultural science and husbandry, forestry, fisheries, and the botanical and zoological survey organizations. The information available is given in Annexure II.

Unfortunately, the information is meagre and incomplete. The matter has, however, been taken up by the Main Committee. The information should be collected within the next three months so that more definite recommendations can be made within the next six months.

The Agricultural Colleges.—The standard of teaching in the agricultural colleges is very variable and on the whole, of rather low quality; this is particularly true in those cases where matriculation is the minimum qualification of admission. The acceptance of this standard for the new Central Agricultural College is regretted. In Great Britain where the standard is generally considered to be higher than in this country, it has been found by the Loveday Committee on Higher Agricultural Education in England and Wales (vide their report published in 1946, extracts given in Annexure I) that the standard requires to be raised further and they have recommended that completion of the first two years of the Honour's Course (corresponding to Part I of the Tripos) should be the minimum qualification for the Bachelor's degree in Agriculture, which itself is a two years' course.

A serious drawback in the present set-up is that crop and animal husbandry are divorced from each other. This is a mistake, especially in India where the prevailing system of farming is essentially one of mixed farming. Degree courses in Dairy Science and Veterinary Science are not available at all in India The Indian Dairy Research Institute, however, offers a 15 month post-graduate diploma course in the former subject, and the Indian Veterinary Research Institute gives short courses in veterinary science.

A reference to the extracts from the Loveday Committee's report will show that different courses of studies are required for the training of agricultural graduates for different types of agricultural work, e.g., for agriculture, for horticulture, for practical farmers, for husbandry work which naturally deals with both crops and live-stock, for advisory work and for agricultural research. At present we have only one type of training and as stated above, with different standards. Although in some cases some alternative subjects are offered at the M.Sc. (Ag.) stage, it is neither sufficient to cover the essential range of subjects nor is the standard at all adequate. Dr. A. B. Stewart has also explained in his report to the Indian Council of Agricultural Research the reasons for starting with graduates in pure science for training in the agricultural sciences.

There is also a pressing need for the study and development of agricultural economics and agricultural engineering which are very much neglected subjects at present. Since agricultural economics is concerned with the business side of farming and farming is essentially a business, the agricultural economist should be associated with all agricultural activity. Agricultural engineering also plays an essential part in agriculture but mechanised methods and machines and implements have to be adjusted to Indian conditions.

Besides an increase in the number of courses taught there is necessary for supplementing courses open to students. For example, a soil scientist working with minor elements must have some knowledge of plant physiology, and a plant physiologist working on nutritional problems needs to possess a knowledge of soil science also. Facilities for training in many specialised branches are absent. Our present system is too rigid and there is no provision for meeting requirements of the kind just referred to. Another lacuna in the present courses in agriculture is that sufficient stress is not laid on acquaintance with actual agricultural practices of the country. Agricultural graduates should be apprenticed for one year to farms and provision should be made to enable them to get a first-hand knowledge of the life of peasants and their agricultural practices; and a certificate given to the effect that they have completed this period of apprenticeship satisfactorily. This should be made an essential qualification for appointment.

In India there is at present no provision for effective advisory work. Men who are to undertake such work require special training and the agricultural colleges should provide for this type of students also. (The basic training necessary for advisory staff has been outlined in the Loveday report).

Besides the training of those intending to serve as scientific officers and research assistants, or as advisory staff, it is necessary to consider the training of agricultural technicians and fieldmen or kamdars who constitute a large and necessary class of staff at farms and for assisting those engaged in extension work. According to the report of the Agricultural Education Committee of the Central Advisory Board of Education (1944), 20,000 kamdars will be required during the next 10—15 years for the Central and Provincial Agriculture Departments.

A regular system of training is necessary for these agricultural technicians, fieldmen or kamdars so that in addition to practical training they may have understanding of the elementary scientific principles underlying agricultural practice and so prove to be efficient workers instead of forming merely a class of inefficient labour, as many of them tend to be at present. This training should be given by the Agricultural schools and colleges.

The defects which have been pointed out may be attributed to the initial low standard of the students admitted (especially in agricultural colleges where matriculation is the requisite qualification for admission), the difficulty of study in a foreign language, the low emoluments of the teachers, lack of leisure for the teachers to do research, inadequate library and laboratory facilities, poor equipment and insufficient personal attention to students arising mostly from inadequate personnel for training. Modern agricultural science is a complex and highly developed subject, and requires adequate equipment and highly trained teachers if proper instruction is to be imparted to students.

Various estimates have been made of the number of agricultural graduates which will be required in the next few years. According to the estimates in the Kharegat Memorandum, the Indian Union comprising 177 districts will require for extension work in the Provinces, 44 Assistant Directors; 176 Superintendents, one for each district; 1,056 inspectors, one for each tehsil; 5,280 agricultural supervisors, one for each circle; and 31,400 Fieldmen, one

for each union. The Agricultural Education Committee of the Central Advisory Board of Education estimated that for the development of agricultural and animal husbandry in the whole of India during the next 10 to 15 years, 300 gazetted officers, 15,000 graduate Assistants, 10,000 non-graduate Assistants, 20,000 field assistants will be required for the agricultural departments and 550 gazetted officers, 4,000 inspectors (graduates) and 20,000 stockmen will be required on the animal husbandry side. For the extension of promising results of research to the cultivator's fields, the technical personnel required as recommended by Dr. A. B. Stewart, will be 1232 field experiment assistants (basic qualifications, graduates of agriculture) at the rate of seven for each district; 1232 soil surveyors at the same rate; and 176 statisticians at the rate of one for each district. These figures are for the Indian Dominion only. The requirement of trained personnel for the Central Institutes have been discussed later.

Compared with the annual output of graduates, which was about 270 and licentiates which was about 290 in 1939-40 (later figures not available), the numbers given in the preceding paragraphs require a very large increase in the output of agricultural graduates and of men trained for agricultural research.

The question is how an immediate increase in number can be achieved. Although it is not possible to give an estimate of actual increase in numbers, one way is to introduce a shift system so as to utilise fully the existing laboratory facilities. This will, however, mean that the number of teachers will have to be increased. To provide for this and for additional accommodation and equipment which may be necessary, the Government should make bloc grants. It should also be possible to establish a Faculty of Agriculture in many universities where this has not been done. Much of the training can be given immediately and economically and also supplementary facilities should not be difficult to arrange. In order that an estimate of the sums actually required and of what can be done immediately to secure diversification of the regular courses of studies and introduction of supplementary courses may be obtained without delay, the Scientific and Technical Manpower Committee should arrange that some of its members may visit the different centres for personal consultation with the Universities, Heads of the Colleges and Institutes concerned, and make their recommendations before the end of three months.

The action suggested above is in respect of immediate needs only, but it would, however, help the formulation of long-term plans. For securing a balanced development of agricultural training, keeping in view the considerations which have been discussed above, it is essential that a Council of Agricultural Education on which both the Centre and the Provinces are represented should be immediately established. It should not be unwieldy in size and consist of representatives of the Central Department of Agriculture, the Universities, Agricultural Colleges, Provincial Departments of Agriculture and the Central training institutes. The Council should be able to submit its report on the short-term aspects within the next six months.

Another immediate necessity is the establishment of farms with a minimum of equipment in each region, characterised by distinctive climatic and soil conditions. Some of the existing experimental stations and smaller farms may be developed for this purpose, but many will have to be located in new sites. The evolution of suitable cropping systems and correlated soil-crop management, which will improve and maintain soil fertility, give an over-all optimum yields of crops over a long time and meet local regional and national needs, should form one of the major items in our policy of agricultural research and development. In view of the many Commodity Research stations and institutes which deal only with the needs of particular crops as distinct from

a cropping system characteristic of soil and climatic regions, it is necessary to consider immediately how the Commodity stations could be fitted into the objective mentioned above. Research and Development in agriculture are intimately connected and to ensure their balanced development a conference of the Directors of Central Research Institutes, and of Commodity Stations and representatives of Provincial Departments of Agriculture in charge of research should be called to consider scientific aspects and evolve a plan of development of research, extension and advisory work.

Universities.—The universities constitute the main source of supply of science graduates and I.Sc's required for specialisation in special branches of science including the agricultural sciences; and it is to the universities that we must look for an increase in the output of such trained men. The remarks already made about the variability and low standard of teaching apply in some measure to the universities also. Besides expansion of what is being done at present in the way of training, it is necessary to effect improvement both in the variety and the standard of the subjects taught. An aspect of the development of scientific training which requires immediate attention is the desirability of introducing something like the 'unit' system prevalent in the U.S.A. This will enable a greater flexibility in the choice of subjects for degree courses as also for supplementary courses of instruction.

Many branches of science are neglected or even entirely omitted. For example, most universities teach Botany but this is done in a general way and systematic botany is not given proper attention. The science of genetics which is so important for a proper study of living things, if taken up at all, is finished in four or five lectures. Numerous such examples could be given. The result is that students who are admitted for postgraduate courses in the agricultural sciences such as plant breeding, plant pathology, agricultural entomology, etc., do not possess adequate basic knowledge necessary and teaching has to be started from the bottom with the natural result that the standard of training cannot be raised.

As in the case of the agricultural colleges, action which may be taken immediately to increase the output and improve and devise the training is to provide additional teachers and increase the grants. It is suggested that a bloc grant equivalent to the total expenditure for one year should be immediately given to each university. They should be permitted to carry over to the next year what they cannot spend within the next six months; such bloc grants will enable comprehensive schemes to be drawn up which will be considered later in detail.

The members of the Manpower and Technical Committee which it has been recommended should go round the agricultural colleges should visit the universities also and make an estimate of their possibilities of improving output as also diversification in so far as they concern agricultural subjects. The Council for Agricultural Education will have as one of its functions the development in the universities of basic sciences related to agriculture.

Central Institutes.—In Annexure III, a, b, c, are given the requirements of the existing and proposed institutes at the centre, for research and training. The summary of the requirements in respect of gazetted staff and technical non-gazetted staff is given below under the heads:—A—Agriculture, B—Animal Husbandry and Veterinary Science, and C—Administrative and Development work.

A. Staff.—Gazetted—770; Technical Non-Gazetted 3,291.

Expenditure (Non-recurring).—557.21 lakhs.

B. Staff.—Gazetted—143; Technical Non-Gazetted 605

Expenditure (Non-recurring).—579.99 lakhs.

C. Staff.— Gazetted—176; Technical Non-Gazetted 196.

Expenditure (Non-recurring).—49.55 lakhs.

Grand Total: Staff.—Gazetted 1,089; Technical Non-Gazetted 4,092.

Expenditure (Non-recurring).—1182.75 lakhs.

The estimates refer to different periods of expansion varying from 3—5 years excepting the staff required for the Indian Council of Agricultural Research which is for one year. The numbers receiving post-graduate training in the Central Institutes and the proposed increase in the annual output thereof is given in statement of Annexure II. It will be seen at a glance that it will be difficult under present conditions to supply for a long time to come quite a major portion of the staff required even of the minimum standard necessary, unless the training programme of the Central Institutes is speeded up in all possible ways.

Great difficulties are being experienced in implementing the expansion schemes of the Research and Training Institutes. These difficulties are:

(a) **Difficulties in getting suitably trained men specially in the higher cadres.** —The main cause for this difficulty is the fact that at present scientists in this country do not receive proper recognition. In other countries scientists are included among the best paid men. In India, however, a distinction is drawn between administrative and scientific services to the disadvantage of the latter. If we are to attract the best brains for scientific work, it is essential that not only should the scientists not be at a disadvantage compared to those serving in administrative and other spheres of work in respect of emoluments, but the status of the scientists should be raised. At present scientists in India tend to have a subordinate status, and steps should be taken to rectify this position. It should be emphasised that it is not the actual amount of the salary that matters, but its comparative value as compared with the emoluments paid in other branches of Government service.

The present system of recruitment through the Federal Public Service Commission is satisfactory for administrative and non-technical services. For the scientific services, however, it is necessary to take cognisance of the fact that some of the most highly talented scientific workers do not care to apply for posts advertised under the present system and in many cases emoluments have to be settled within the scale by negotiation, and a method must be found by which services of these men can be obtained. Machinery is also needed for the expeditious filling up of temporary vacancies. This can perhaps best be done by local selection committees on which a representative of the Department and Commission will be present. The existing system, therefore, requires to be made more flexible to deal with these two points, and greater liaison should be established between the Federal Public Service Commission and departmental representatives so that decisions may be taken more quickly.

It is necessary to send abroad men who are already working in universities and official and non-official research institutes and who have the necessary training and experience to benefit by visits to important institutions abroad where they can see the latest advances in technique and equipment and make contacts with leading research workers in their respective fields. The present system of sending raw graduates abroad cannot be justified except in the case of subjects where facilities for training are not available in this country. It may also be desirable to give a larger number of scholarships to induce graduates and post-graduates to come to the existing research institutes in larger numbers than at present.

(b) The second difficulty is the lack of adequate equipment. At present facilities in regard to equipment are inadequate and out of date in most of the scientific and technical institutions. In many of them it has not been possible since 1939 even to replace what they had and very little upto-date equipment is

available. Apart from providing the finances which are required, the government can immediately assist by making dollar exchange facilities available direct to the industries and by removal of restrictions on the import of scientific equipment. It is one of the avowed objects of the UNESCO to help in the matter of procurement of books, journals, apparatus and other materials required for research. Arrangements should be made immediately with the Indian Supply Mission in America and the High Commissioner in the United Kingdom for importing the necessary equipment. Arrangements made through official agencies, however, tend to be slow and there are other disadvantages. The importance of giving full scope to Indian agencies for importing and supplying scientific equipment requires to be emphasised. Because of their business interest and dealings with manufacturers abroad they can ensure a quicker supply, fuller information and a wider choice of instruments and materials. Government should encourage Indian agencies as with experience they are likely to undertake manufacture of scientific instruments as some have already done. Government may also as a matter of policy encourage the establishment of firms undertaking the manufacture of apparatus, chemicals, and instruments required for scientific research. Every institute should be asked immediately what their requirements are in respect of dollars so that the total requirements may be estimated and early action taken to secure what is required.

(c) **Buildings.**—Under the present system a very great deal of time is wasted in the construction of buildings even though funds have been sanctioned and plans approved. Although, for example, additional accommodation urgently required at the Indian Agricultural Research Institute was sanctioned a long time ago, practically no progress has been made up-to-date. Besides many items of ordinary equipment and fittings of the laboratories for scientific work have to be made through the C.P.W.D. and it takes unduly long time to do such work. Under such conditions, the research worker may have to sit idle for lack of the necessary facilities or divert his attention to some other item of work and eventually lose incentive and interest.

(d) One outstanding cause of delay in progress is the time taken for decision on many points relating to the staff, equipment, and work of the research institutes. Quite often many schemes urgently required in connection with greater food production have got stuck up at various stages.

The remedy for this and other difficulties enumerated above lies in—

(1) a greater delegation of power to the heads of the research institutes;

(2) funds should be placed at their disposal in the form of a block grant to implement programmes approved by government. The head of the institute should further have the authority once a scheme has been approved and funds allotted to take action he considers most appropriate to achieve the desired results without delay.

(3) Committees should be set up on which representatives of the Central Public Works Department and the Finance Department will sit with representatives of the Department of Agriculture and the head of the institute to expedite action.

(4) Decisions on technical matters should be arrived at in fullest consultation with technical men at all stages. For any changes for reasons of policy technical men should be taken in full confidence.

J. N. MUKHERJEE.

LIST OF ANNEXURES

ANNEXURE I—Extracts from Loveday Committee's Report on Higher Agricultural Education in England and Wales, 1946.

ANNEXURE II—Statement showing the number of passes in Agricultural Courses of various categories:—

(A) 2-year courses in agriculture; (B) Number of passes in Agriculture Degree Examination; (C) Post-graduates in agricultural sciences at the I.A.R.I., (D) 2-year courses in Dairying (I.D.D.); (E) Post-graduates in Dairying at the Indian Dairy Institute, (R) Statement showing the institutions under the Agricultural Department, their present output of trained personnel and proposed output under expansion scheme.

ANNEXURE III—Requirement of various existing and proposed Institutes at the Centre for (A) Research and training in Agriculture, (B) Research and training in Animal Husbandry and Veterinary Science and (C) Administrative and Developmental work.

ANNEXURE IV—Estimates of the requirements of technical personnel in the provinces (A) for extension work as recommended in the Kharegat Memorandum, (B) as recommended in the Report of the Agricultural Education Committee of the Central Advisory Board of Education, 1944 and (C) for experimental and investigational work in the provinces as recommended by Dr. A. B. Stewart in his Report on Soil Fertility Investigations in India.

ANNEXURE V—Extracts from the Report on Soil Fertility Investigations in India for planning and conduct of future experiments, 1947.

ANNEXURE VI—Training of students abroad.

ANNEXURE I

Extracts from Loveday Committee's Report on Higher Agricultural Education in England and Wales, 1946

Classes of the whole range of occupations for which the system of this agricultural education may have to provide:—

1. *The Practical Farming Class.*

   Farmers (general and specialist, including managers on the large farms);

   Commercial horticulturists;

   Park superintendents and head gardeners.

2. *The Estate Management Class.*

   Landowners; Rural estate agents; County land agents; Land Commissioners; Rural land utilization officers.

3. *The Advisory Class.*

   Scientific Advisers (including bacteriologists); Agriculture; husbandry advisers; Horticultural advisers.

4. *The Teaching Class.*

   Teachers of science and school gardening in secondary schools or county colleges; Farm Institute lecturers; University college lecturers in husbandry and the agricultural science.

5. *The Research Class.*
   Fundamental research workers, Husbandry research workers.

6. *The Economic Class.*

   Agricultural economists (engaged in research, teaching or advisory work) Farm management experts; Marketing officers.

7. *The Engineering Class.*

   Agricultural engineers; Experts on mechanised husbandry; Civil engineers and architects.

8. *The Commercial Class.*

Agricultural and Horticultural Teaching in the University (*paragraphs* 17—21).—The ordinary courses in agriculture and horticulture at present offered by the universities are 3-year courses to which the student may be admitted on matriculating or securing exemption from matriculation. The arrangement of the courses varies amongst the different universities. Teaching of pure science upto the Intermediate standard is essential. If one is devoted to it, the remaining two years are not enough for the theory and practice of agriculture or horticulture to be brought upto a satisfactory standard. It was therefore recommended that either the standard of pure science presupposed by the 3-year course should be extended to four years.

As a good grounding in the natural sciences must be the foundation of agricultural or horticultural study at the university, students in their one year or two at school should give time to the study of chemistry, biology and physics with the necessary mathematics. Universities would be justified in taking for granted in their teaching the appropriate standard of scientific knowledge without necessarily imposing any formal test. This may compel the students to stay at school till they were nineteen, which should not be discouraged.

The improved degree courses represent the highest level at which agriculture or horticulture can be taught, but they are materially below science honours degree courses. More advanced teaching in agriculture or horticulture can best be given in the form of graduate course designed to follow at least the

first part of an honours' degree course in pure science, that is to say, by two years' study of pure science at honours level.

Courses Recommended.

Improved degree courses in Agriculture (paragraphs 22-23).—The specific aims of a university course suitable for the practical man are:—

(a) to give a thorough understanding of British Agriculture as an industry and to promote thought about it by providing an education on a broad scientific basis;

(b) to impart appropriate knowledge of the sciences, of their agricultural applications and of the physical, biological and economic factors by which agricultural policy and practice are determined;

(c) to give such knowledge of British Agricultural practice, based on principles, as is required for an understanding of the application of the sciences to agriculture and as a preparation for farming and related activities.

The existing courses for a degree in agriculture have not in the main been consciously planned in accordance with the foregoing principles. On the understanding that each university would interpret them in accordance with its own experience, judgment and academic policy, the details of the ordinary degree course in agriculture as a training for the general farmer have been set out above.

The following courses of study are contemplated. They include existing courses with or without modification.

List of the Courses.

1. Improved degree courses in Horticulture (paragraphs 71—75).

2. Two-year courses of less than the degree standard, in agriculture (paragraphs 34-35).

3. Two-year courses of less than the degree standard, in horticulture (paragraphs 76-77).

4. Two-year courses of less than the degree standard, in Estate Management (paragraph 66).

5. Graduate Courses—

(i) Agriculture for graduates in science who intend to become husbandry advisers, husbandry teachers or practical farmers (paragraph 95).

(ii) Agriculture for graduates in agriculture who intend to become husbandry advisers or teachers (paragraph 96).

(iii) Agriculture for graduates in commerce who intend to become marketing officers (paragraph 132).

(iv) Agriculture and estate management for graduates in science (law or economics) who intend to become teachers or research workers in estate management (paragraph 63).

(v) Agriculture and agricultural economics for graduates in economics who intend to become agricultural economists (paragraph 127).

(vi) Agriculture and farm machinery for graduates in engineering, who intend to become agricultural engineers (paragraph 142).

(vii) Agriculture, water supply, land drainage and irrigation for civil engineers who intend to become drainage or irrigation engineers (paragraph 149).

(viii) Agricultural sciences for graduates in science who intend to become research workers or scientific advisers in agriculture or teachers of agricultural science (paragraph 86).

(ix) Horticultural sciences for graduates in science who intend to become research workers or scientific advisers in horticulture (paragraph 104).

(x) Horticulture for graduates in science who intend to become advisers in or teachers of horticulture or practical horticulturists (paragraph 105).

(xi) Horticulture for graduates in horticulture who intend to become advisers in or teachers of horticulture or practical horticulturists (paragraph 105).

(xii) Poultry husbandry for graduates in science who intend to become research workers or scientific advisers on poultry problems (paragraph 100).

(xiii) Poultry husbandry for graduates in agriculture (with a variant for graduate in science) who intend to become advisers in or teachers of poultry husbandry (paragraph 101).

(xiv) Estate managements for graduates in agriculture who intend to become rural land agents or the like (paragraph 62).

(xv) Agricultural economics for graduates in agriculture who intend to become agricultural economists or farm management experts (paragraphs 128 and 130).

(xvi) Engineering and farm machinery for graduates in agriculture who intend to become farm mechanization experts (paragraph 143).

(xvii) Commerce for graduates in agriculture who intend to become marketing officers (paragraph 132).

(xviii) Bacteriology for graduates in science who intend to become advisory bacteriologists, dairy bacteriologists, or the like (paragraph 90).

The Husbandry Adviser.—The training of the husbandry adviser presents greater difficulty. It is in this branch that the staff employed have in the past differed widely in the intellectual calibre and technical qualifications. Whereas the staffing of the specialist advisory service has been governed by the standards of the universities and colleges by which its members are directly employed, the general advisory service has been staffed more or less at random with graduates of various kinds and with holders of one or other of the university, college of national diplomas whose standards vary greatly amongst themselves. In certain specialised branches of husbandry there has been, at any rate until lately, no specific qualification higher than a national diploma: in the absence of any general standard and in face of practical objections to prolonged training, the diploma has perforce been accepted as constituting in itself a sufficient qualification, in spite of informed criticism of the shortcomings of diploma courses, especially on the scientific side. This inequality should not be allowed to persist in the National Agricultural Advisory Service, not only because of its need for staff of the highest quality but also because, if it is to attract the best men into all its branches, it must offer opportunities of a progressive career which, as the Luxmoore Committee pointed out, the old country service failed to provide. If, as we believe to be desirable and we understand to be intended, the higher posts in the National Agricultural Advisory Service, which will require administrative capacity as well as technical competence, are to be open to any member of the staff who shows the necessary talent, whatever his specialist field, it is imperative that there should be a common minimum standard of qualification throughout the service.

We therefore believe that the best candidates for husbandry advisory posts are likely to be found amongst students who have taken an initial course in

pure science. We hope that some of them will be men who, on developing the appropriate interests, turn over to agriculture at the end of a full honours course, notwithstanding the length of the complete course of training thus involved. A strong enough foundation of scientific knowledge would however, be provided by the first part of the honours degree course, that is to say by two years' study of pure science at honours level. To either course of training two years' study of agriculture and the agricultural sciences must be added. It seems to us immaterial whether this be treated as a graduate course or the second part of a four-year degree course of which pure science of honours standard form the first part. The essential point is that two years of agriculture are superimposed on a good honours standard in pure science.

We have considered whether it is desirable and practicable to provide separate courses of training in the specialized branches of farming such as crop husbandry, grassland management and dairy farming. They would obviously be useful and we see no reason why a university should not, if it so desires give a specialist bias to a graduate course such as we have recommended in the last paragraph. The amount of material provided by any one branch, however, that would be suitable for teaching at graduate level seems to us to be scanty and the number of students wishing to take a particular course at one time might be so small as to render its provision uneconomic. As a general rule, therefore, we think that the need for specialists in the different branches of husbandry can best be met by men with a general training who are later led by personal predilection to acquire special knowledge through private study and practical experience.

For the husbandry adviser, as for the scientific adviser, any graduate course must obviously be regarded as only part of a longer training that includes the whole of his probationary period. Indeed the arguments advanced in paragraph 88 apply with even greater force to the husbandry adviser, who will be in more constant contact with farmers and will need a thorough first hand knowledge of farming practice if he is to carry conviction. For this purpose the probationary period should include attachments to advisory centres and experimental farms, as well as opportunities for travel, particular investigation and private study, before the probationer takes up his first post under a district officer. Except for the scientist turned agriculturist, who must needs take a systematic course of instruction in agriculture as part of his initial training, any formal course of graduate study should not necessarily be taken at the beginning of the probationary period, but might well follow a spell of practical experience in the field. We have already suggested that arrangements for the training of advisory officers should be as elastic as possible, and we believe that for husbandry advisers in particular there is a fruitful field for experiment on the part of the Ministry for collaboration with the universities and the research institutes,

Research.—Research is the foundation of technical efficiency and progress. Advisers and teachers are in their several spheres the channels by which a knowledge bearing on agricultural problems is conveyed to those who can give effect to it in improved practice: they are dependent for that knowledge on the constant prosecution of research. Research work ranges from the pursuit of knowledge for its own sake without regard to its utility, through the investigation of specific problems that raise scientific questions of a fundamental character, to enquiries into matters closely related to every day practice. Agricultural research may for our purposes be regarded as excluding the purely "disinterested" search for knowledge and as confined to systematic investigation, whether fundamental or practical, such as may be conducted by university departments of agriculture or by research institutes under the control of the Agricultural Research Council or the Ministry of Agriculture.

Agricultural research demands the highest qualities of intellect and initiative. It offers no scope for routine workers except in subordinate posts. For the strictly scientific branches a first or good second-class honours degree in a suitable combination of natural sciences is necessary. Specialised knowledge of the particular branch of pure science appropriate to the student's prospective field of activity may be obtained either before or after graduation, but in any case it must be brought up to the highest standard. Valuable contributions to agricultural research work may be managed by scientists with no knowledge of agricultural theory or practice, but it is clearly desirable that provision should be made for training prospective research workers in the appropriate branch of applied science. The graduate courses that we have recommended for the training of the scientific adviser (paragraphs 86 and 104) would be useful for that purpose. We have referred to the desirability of providing so far as possible a common training of the research worker. Flexibility is essential and a formal course is only one way of meeting his needs at the graduate stage. In his probationary period he may profitably be attached to advisory centres or to overseas research stations, but some time must always be spent in research under the supervision of an experienced worker.

The training of research workers in agricultural economics and in agricultural engineering is discussed under those general headings in the following paragraphs.

ANNEXURE II

Statement showing the number of Passes in agricultural courses of various categories

A—2 year courses in agriculture—

	1937-38	1938-39
Lyallpur	37	31
Dhulia	16	14
Dacca	18	22
Bulandshahr	30	34
Gorakhpur	36	41

B.—*Number of passes in Agricultural Degree Examination—*

Name of Province	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	Total
Assam	..	..	..	..	..	..	..	..	..	..	..
Bengal	..	..	..	..	..	..	..	..	..	..	..
Bihar	..	..	..	..	..	..	..	..	..	..	..
Orissa	..	..	..	..	..	..	..	..	..	..	..
Madras	24	31	55	48	40	30	29	28	30	41	356
Bombay	67	53	..	78	54	42	42	42	48	54	480
C. P.	18	9	..	24	19	26	22	15	17	22	172
Delhi	..	..	..	..	..	..	..	..	..	..	..
N. W. F. P.	..	..	..	..	..	..	..	2	1	2	5
U. P.	..	32	37	30	50	30	55	55	51	65	405
Sind	..	..	..	..	..	..	..	..	..	..	..
TOTAL	109	166	126	238	228	174	163	158	205	242	1,809

Figures for 1939-40—Masters of Agriculture 24
Bachelors of Agriculture 269
Licentiates of Agriculture 289

C.—*Number of Post-graduates in Agricultural Sciences at the I. A. R. I.*—

1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	
10	10	9	12	10	17	13	13	10	12	2-year course.
4	5	5	3	3	2	4	1	9	3	1-year course for agricultural students.
									4	Plant Protection.

D.—*2-year courses in Dairying (I. D. D.)*—

	1937-38	1938-39
Bangalore	23	...
Allahabad	..	21

E.—*Post-graduates in dairying at the Indian Dairy Institute, Bangalore*—

1937-38 . . . . 6, 1938-39 7

N. B.—The figures, as far as available, have been incorporated above.

F.—*Statement showing Institutions under the Central Government, Department of Agriculture, their present output of trained personnel and proposed output in expansion schemes.*

List of Institutions	Average annual output	Expected output
Indian Agricultural Research Institute, New Delhi.	19 post-graduate students.	A 5 year development plan has been sanctioned for the expansion of the Institute with effect from the 1st August, 1946, and when the plan is in full swing the annual output will be 100 Agricultural post-graduate students.
Central College of Agriculture, New Delhi.	....	It is a post-war development scheme and when in fullswing the annual output will be 60 degree students per year. The classes will be started in July, 1947. The first batch will come out in 1951.
Botanical Survey of India, Calcutta.	6 officers are trained annually in systematic Botany and Taxonomy.	A re-organisation plan has been sanctioned but it will not affect the output.
Horticultural Training Class for Agricultural Graduates (under the Agriculture Department).	25 students . .	Nil.
Ladies Training Class in Advanced Fruit Preservation (under the Agriculture Dept.).	25-30 lady students.	Nil.
Institute of Fruit Technology, Lyallpur.	24 students . .	Nil.
Superior Forest College, Dehra Dun.	30 superior officers .	An increase of 25 is expected in 1949 and 60 in 1950, the output will be 90 superior officers. This is due to the post-war expansion of the Institute.
Indian Forest Ranger College Dehra Dun.	26 Rangers . .	An increase of 65 is expected in 1949 and 95 in 1950. This will be due to improvement in the Rangers College.
Marine Fisheries Research Station, Madras. / Indian Fisheries Research Station, Calcutta.	Short Fisheries' Training Course (20 students).	Some development plans are under consideration and their effect on the output cannot be anticipated at the moment.

List of Institutions	Average annual output	Expected output
Deep Sea Fishing Station, Bombay.	....	It is not proposed to institute any regular training course at this station.
Zoological Survey of India.	4	With a view to obtaining suitable Zoologists required in connection with the future expansion of the survey an *ad hoc* scheme for training 4 candidates in the systematics of Zoology for 2 years was sanctioned in 1945. The scheme is expected to be continued for about 5 or 6 years. If the development plans for the Z.S.I. are implemented the output may increase to 6.
Indian Veterinary Research Institute.	40 post-graduate students.	In the re-organisation scheme which is still under consideration and which provides for additional buildings and staff etc. the output will be about 72-post-graduate personnel. It may, however, be mentioned that I. V. R. I. is not primarily a teaching institute. Its main object is Research in Veterinary.
Indian Dairy Research Institute.	(*a*) I. D. D. Course—25. (*b*) Post-graduate Course—12. (*c*) Short Courses—30.	In the re-organisation scheme of the I. D. R. I. which also is under consideration it is expected that provision would be made at the start for training out some 25 B.Sc.'s (Dairy Science personnel annually rising to 40 in subsequent years in addition to the other courses.

ANNEXURE III

Requirements of various existing and proposed Institutes at the Centre for Research and Training

A.—*Agriculture*—

Indian Agricultural Research Institute (Five years).

Gazetted	56	*Non-recurring Expenditure in lakhs.*	
Technical Non-Gazetted	205	Buildings	52.00
Annual Average	52	Equipment	8.00

Indian Fisheries Research Institute (Three Years).

Gazetted	64	*Non-recurring Expenditure in lakhs.*	
Technical Non-Gazetted	48	Capital	63.99
Annual Average	37		

Institute for Fruit Culture (Three Years).

Gazetted	28	*Non-recurring Expenditure in lakhs.*	
Technical Non-Gazetted	154	Buildings	10.75
Annual Average	61	Equipment	6.00

Institute for Vegetable Culture (Three Years).

Gazetted	27	*Non-recurring Expenditure in lakhs.*	
Technical Non-Gazetted	131	Buildings	10.18
Annual Average	53	Equipment	6.00

Institute of Agricultural Economics.

Gazetted	9
Technical Non-Gazetted	39

Agricultural Marketing Department (Three Years).

Gazetted	76	*Non-recurring Expenditure in lakhs.*	
Technical Non-Gazetted	20	Buildings	5.00
Annual Average	32	Equipment	.70

Soil Conservation Units (Three Years).

Gazetted	30
Technical Non-Gazetted	92
Annual Average	41

Ornithology in Relation to Agriculture (Three Years).

Gazetted	19	*Non-recurring Expenditure in lakhs.*	
Technical Non-Gazetted	133		
Annual Average	51	Capital	.59

Central Commodity Committees (Three Years).

Gazetted	375	*Non-recurring Expenditure in lakhs.*	
Technical Non-gazetted	2,250		
Annual Average	875	Capital	360.00

Central Agricultural College (Four Years).

Gazetted	24	*Non-recurring Expenditure in lakhs,*	
Technical Non-Gazetted	55	Building	19.00
Annual Average	20	Equipment	10.00

Rice Research Institute (Five Years).

Gazetted	22	*Non-recurring Expenditure*	5.00
Technical Non-Gazetted	84		
Annual Average	21		

Zoological Survey of India.

Gazetted	40	On account of impending constitutional
Technical Non-Gazetted	80	changes, the implementation of the scheme has been held up.

B.—*Animal Husbandry and Veterinary Science.*

Indian Veterinary Research Institute (Three Years).

Gazetted	38	*Non-recurring Expenditure in lakhs.*	
Technical Non-Gazetted	34	Buildings	32.69
Annual Average	24	Equipment	2.50

Anti-Rinderpest Organization (Four Years).

Gazetted	4	*Non-recurring Expenditure in lakhs.*	
Technical Non-Gazetted	147	Buildings	2.8
Annual Average	38	Equipment	30

Bull-Breeding Farms (Five Years).

Gazetted	50	*Non-recurring Expenditure in lakhs.*	
Tehnical Non-Gazetted	250	Buildings	200.00
Anual Avarage	60	Equipment	50.00

Central Breeding Farms (Three Years).

Gazetted	6	*Non-recurring Expenditure in lakhs.*	
Technical Non-Gagetted	51	Buildings	65.50
Annual Average	19	Equipment	28.00

Experimental Livestock Breeding Farms (Five Years).

Gazetted	22	*Non-recurring Expenditure in lakhs.*	
Technical Non-Gazetted	114	Buildings	111.20
Annual Average	27	Equipment	42.00

Central Animal Husbandry College (Four Years).

Gazetted	23	*Non-recurring Expenditure in lakhs.*	
Technical Non-Gazetted	9	Buildings	38.55
Annual Average	8	Equipment	6.45

C.—*Administrative and Development Work.*

Indian Council of Agricultural Research (One Year).

Gazetted	45	*Non-recurring Expenditure in lakhs.*	
		Buildings	25.00
		Equipment	1.00

Indian Council of Agricultural Research, Information Section (One Year).

Gazetted	8	*Non-recurring Expenditure* Equipment	15·0

Quarantine Stations for plants (Three Years).

Gazetted	80		
Technical Non-Ggzetted	160	Non-recurring	6·30
Annual Average	80		

Plant Protection Organization (Three Years).

Gazetted	31		
Technical Non-Gazetted	31	Equipment	1·00
Annual Average	21		

Land Utilization Board.

Gazetted	5	Equipment	1·00
Technical Non-Gazetted	5		

Indian Council of Co-operation.

Gazetted	7	Capital	·25

ANNEXURE IV.

Estimate of requirements of technical personnel in the Provinces.

A. *As estimated in the Kharegat Memorandum (for extension work).*

In India (Dominion) as it will be on 15th August, there will be 176 districts taking 4 districts for a Division—the number of Divisions comes to 44.

Rough approximation can be obtained by taking an average of 12,000 villages for a Division, 3,000 for a district, 5,000 for tehsil, 100 for Kanungos' circle and 20 for a union.

	Total
Kamdar (Fieldman)—1 for each union	31,400
Agricultural Supervisor for each circle	5,280
Inspector at each tehsil	1,056
Superintendent for each district	176
Assistant Director for a Division	44

B. *Estimates prepared by the Agricultural Education Committee of the Central Advisory Board of Education*, 1944.

It is estimated that during the next 10—15 years the personnel required by Government Departments for the development of Agriculture and Animal Husbandry will be as follows:—

Agriculture

	Total
Field Assistants (Kamdars)	20,000
Non-graduate Assistants	10,000
Graduate Assistants	1,500
Gazetted Officers (Classes I and II)	300

Animal Husbandry—

Stockmen	20,000
Inspectors (Graduates, of the rank of Veterinary Assistant Surgeons)	4,000
Gazetted Officers (Classes I and II)	550.

To enable one to consider the full implications of the above programme, so far as institutions of Agricultural Education are concerned, the nature and length of the training required, for the different grades of personnel may also be stated here.

Agriculture.—

Field Assistants.—One year's course at a Farm Institute which will be located on a model farm.

Non-graduate Assistants.—2 years' course at a special Agricultural School or the normal course at an Agricultural High School.

Graduate Assistants.—4 years' course at an Agricultural College or University.

Gazetted Officers.—A suitable post-graduate course of at least 2-3 years' duration.

Animal Husbandry—

Stockmen and Compounders.—One year's course partly at a Departmental laboratory and partly at a Farm Institute, which is equipped for training in Animal Husbandry.

Inspectors (or Veterinary Assistant Surgeons).—4 years' course at a Veterinary College.

Gazetted Officers.—A suitable post-graduate course.

It is obvious that in order to meet these demands it is necessary to bring into existence as early as possible a comprehensive and planned system of Agricultural Education.

C. *Estimates of requirement of technical personnel as recommended by Dr. A. B. Stewart in his Report on Soil Fertility Investigations in India for the Planning and Conduct of Future Experiments.*

Field Experiment Assistants—7 for each district	1,232
Statistician—1 for each district	176
Soil Surveyors—7 for each district	1,232

(These figures represent the requirements of the Indian Dominion only.)

N.B.—(The ultimate target should be one field experiment assistant for each tehsil. The number of tehsils under the Indian Union will be 1,056, so that the total number of field experiment assistants ultimately will be 1,056).

ANNEXURE V.

Extracts from the Report on Soil Fertility Investigations in India for the planning and conduct of future experiments by Dr. Alexander B. Stewart.

General requirements.—These have been discussed with particular reference to financial outlays, direction of research and extension work, staffing, and a Central Agricultural Information Bureau. The need for a vastly increased expenditure on agricultural research has been underlined, and attention has been drawn to the need for distinguishing clearly between experimentation and the question of whether a particular discovery will be profitable to agriculture. An experiment cannot be expected to pay its way. The view has been expressed that. to meet the demands of modern science as well as the demands of extension work, the time is now ripe for the appointment in each Province and major State of a scientist as a whole-time director of research, in addition to a whole-time director of extension work. It is equally important to ensure that such directors will have adequate number of well-qualified staff under them. There is, in the writer's opinion a very great need for improving the status and salaries of the staffs of agricultural departments in India. The need for whole time field experiment assistants, who could give to individual experiments the care and attention which they require, has been stressed, and the view has been expressed that in the future more attention should be given to the recruitment of graduates in pure science to the agricultural service. Reference has been made to the possibility of setting up a Central Agricultural Information Bureau, which, it is considered, could serve a very useful function in helping Indian workers to keep abreast of the latest developments in agricultural science, both in their own and in other Countries. Other points of general importance have also been summarized under the headings of soils, crops. manurial experiments and cultural practices.

Bridging the gap between knowledge and practice.—Whilst much has still to be learned, it is essential to avoid stagnation in extension work whilst further information is being acquired. The Indian cultivator and his soil are badly in need of help now, and several examples have been given of points to be borne in mind in a normal extension work programme; although each ameliorative measure by itself may make only a slight apparently negligible contribution to general improvement, their effect in aggregate may well become appreciable. A great increase in the use of manures and fertilizers is one of the most pressing needs of Indian agriculture especially in areas where the introduction of irrigation has eliminated lack of water as a limiting factor in crop growth, and the need for ensuring the return to the soil of all materials of manurial value has been emphasized. Attention has also been drawn to other outlets for the extension officers' energies, and the value of models in propaganda work has been stressed. Other suggestions have been made under the heads of (a) Dry farming, (b) Irrigation, (c) Commercial exploitation of useful discoveries, and (d) Land reclamation.

Simple experiments in cultivators' fields.—Reasons why such experiments are necessary have been given and the objectives of such work are stated as: (i) to find the average response to a particular manurial supplement or similar agricultural improvement measure in a given tract, and (ii) to study the interaction of this response with local variations within the tract, and thereby obtain information as a basis for making practical recommendation which would be applicable to specific condition. For reasons which have been discussed, it is suggested that these experiments should be based on districts as major units, with sub-division on the basis of tahsils and villages. The factors of principal importance in the planning and conduct of these experiments have been considered under the following heads: (1) Practical limitations, (2) Statistical considerations, (3) Extension of scope of crop-cutting surveys, (4) Organization of experimental work, (5) Environmental conditions and data on soils, (6) Experimental treatments and (7) Evaluation of results.

Organization of experimental work.—I have already stressed the need for whole-time field experiment assistants on the staffs of agricultural departments, and the number of assistants available will naturally determine the extent to which a scheme of experimentation, such as I have suggested, can be undertaken in any Province or State. As a prelude to obtaining the necessary recruits, the first step which should be taken by responsible authorities is to approve in principle the need for field experiment assistants. As will be seen later, field experiment assistants will also be necessary for detailed experimental work at deliberately selected centres, as distinct from assistants for simple experiments in the cultivators' fields. For the detailed experiment work, such assistants should be responsible to the research officers in charge, whilst assistants for the latter type of experiments, which as indicated really serve as a link between academic research and extension work, should, I suggest, be recruited on a district basis and be responsible to the Deputy Director of Agriculture who, in turn, should maintain close contact with the research officers. If, because of other duties, the Deputy-Director of Agriculture in a particular district is unable to assume responsibility for the conduct and supervision of the field experiment work, an officer may have to be appointed specially for the purpose. For experimental work of the simple type in cultivators' fields, I suggest further that an ultimate target of at least 1 field experiment assistant per tahsil should be set. The supervision and conduct of all field experiments on agricultural holdings within the tahsil would be the personal responsibility of the field experiment assistant who, in addition to making all the necessary arrangements for the laying down and harvesting of the experiments, should also record relevant environmental details and observations on the crop during its period of growth, in addition to undertaking for the agricultural chemist such sampling of soil and produce as may

be necessary for the attainment of objective (ii) of the scheme. It is highly desirable that the field experiment assistants should receive from the officer-in-charge brief courses of detailed instruction on all points affecting the conduct and supervision of the experiments.

In the interval until field experiment assistants are available in sufficient numbers to permit of experimentation on the extensive scale which is necessary, it is important to achieve as much as possible with existing staffs. The extent to which this is possible will vary in different parts of the country, but I suggest as a first step that each Province and major State should endeavour to carry out the scheme in at least one district. I think it well at this stage that all resources should be concentrated on obtaining accurate information for individual districts, as this is likely to yield more tangible results than would be obtained by attempting with inadequate staff to cover larger areas. The primary need for the success of the scheme on a district basis is a minimum of about 6 or 7 field experiment assistants, depending on the number of tahsils, and in each Province and State I suggest that this number of staff should be assigned to full-time work of the scheme.

Research and detailed experimental work of carefully selected centres.—The second main type of experimental work, which should be undertaken simultaneously, has been considered under the following heads: (1) Objectives, (2) Outstanding gaps in knowledge, (3) Selection of centres for experiments, (4) Sub-division of experimental areas, (5) Water and manures, (6) Crop rotations, (7) Cultural practices, (8) Other experiments, (9) Soil surveys and (10) Laboratory investigations.

Selection of centres for experiments.—Reference is made to the unsuitability of many Government farms for further manurial experiment work and to the need for many fresh experimental centres. Such centres, unlike those in 3(a) above, where random selection has been advocated, must be carefully chosen in the light of all existing knowledge of soil, climatic and agricultural conditions in the area which the centre is to represent. A few of the more important considerations affecting the choice of such sites have been outlined, and it has been suggested that the primary selection should be based on data of the type illustrated by the map (p. 18) showing the general distribution of soils in India, with further sub-division on the basis of such factors as textural variations, salt contents, prevailing cropping practices, water supply position, present fertility levels, etc., and with ultimate responsibility for the selection of the centre resting on the agricultural or soil chemist. Concerning the control of land selected for such experiments three main possibilities have been discussed: land on the holdings of co-operative and willing cultivators, land on the estates of progressive *zemindars*, and land which could be acquired, through the revenue departments, for a period of about 10 years. Unduly large acreages of land should not be necessary, as it is felt that, at this stage, more is likely to be gained from a fairly large number of relatively small units than from a smaller number of larger units.

Sub-division of experimental areas.—The suggestion has been made that from the outset, the experimental area should be sub-divided into blocks and maintained as such throughout the period of experiment. There should, for instance, be separate blocks for experiments on water and manures, crop rotations, and cultural practices, as well as a block for other work, such as Botanical investigations. Such questions as ultimate responsibility for particular experiments, methods of cultivation and general management of experiment areas, and possible experimental treatments have geen discussed under the appropriate heads.

Soil surveys.—It is impossible to utilize efficiently the resources of a country unless there is available a knowledge of what the resources are and where they are distributed. A soil survey aims at providing an inventory of a country's

soil resources and reference has been made to general aspects of soil survey work in India. The suggestion is made that in the future greater attention should be given to the systematic mapping of soils by means of field studies supplemented by simple laboratory data. Results obtained in the Bombay Province are referred to as providing an example of the practical value of basing investigations on problems of crop production on the results of soil survey. For the attainment of objective (ii) in simple experiments on cultivators' fields, field and laboratory data on soils are necessary, and the suggestion has been made that consideration should be given to the possibility of carrying out soil surveys in at least a few of the districts in which these simple experiments are being conducted over a 3-year period. In view of the vast acreages involved and because of lack of staff, reconnaissance mapping on the scale of 1 inch=1 mile has been suggested. It is estimated that about 7 trained soil surveyors (with suitable labour assistance) would be needed to map a district on this scale in 3 years, and observations have been made on the selection of suitable districts, the methods which might be adopted and the type of information which could be obtained.

Soils.—Whilst there is an urgent need for concentrating on practical work, it is necessary not to lose sight of the fact that a great deal of purely scientific work is required in order to arrive at a correct knowledge of the manurial requirements and crop producing capacities of the various types of soil. Knowledge of the soils is also necessary to ensure the success of irrigation projects, to help in decisions regarding prevention of salinity, or methods to be adopted in the reclamation of saline soils, and to serve as a basis for the interpretation of the results of agricultural experiments, the sites for which should depend more on the suitability of the particular soil than on the availability or accessibility of a given centre.

Environmental conditions and data on soils.—The foregoing observations deal primarily with the attainment of what I have called objective (i) of simple experiments in cultivators' fields, *i.e.*, the measurement of average response in a district as a whole. Objective (ii) is concerned with the need for obtaining information which will be necessary before advice can be given on problems of specific or local importance resulting from variations within the tract. Such information can be obtained only if adequate data on soil and other environmental factors are available for correlation with the field experiment results.

Soil Data.—In Chapter I, I dealt at some length with the general distribution of soils in India and with the more important soil conditions affecting crop growth. It is very desirable that as much information as possible on the soils of the experimental areas should be acquired, for correlation with the field experiment data, as it is only in this way that experimental findings in one area can be of value to another, where similar soil conditions may obtain. I shall deal in greater detail with future work on soils in section 3 (b), and at this stage it will be sufficient to emphasize that it should be the responsibility of the agricultural chemist to make sure that relevant data on the soils of the experimental areas should be available for correlation with the yield data. The field examination of the profile and the sampling of the soil of an experimental area should be undertaken before the experiment is laid down, and wherever possible, this should be done by a trained soil surveyor, who could define the type in terms of an All-India grouping, such as that illustrated on the map facing page 8. Where this is impossible, the work may have to be undertaken by the field experiment assistant, who, as already indicated, should in any case have received from the agricultural chemist a brief course of detailed instruction on the field examination and sampling of soils. Each field experiment assistant could then be instructed that, before laying down an experiment, he should (a) record a field description and (b) take whatever soil

samples are necessary. The latter, together with the field description, could then be forwarded to the agricultural chemist who, after the necessary analyses had been completed, could tabulate the field and laboratory data which should form part of the experiment record.

Laboratory investigations.—Pot and laboratory methods for the characterization of the nutrient status of soils are arbitrary, and before they can be expected to furnish reliable information in the diagnosis of soil deficiencies, their results must be checked or calibrated against an adequate background of field experiment data. Particular reference has been made to the establishing of limiting values and the assessment of the relative merits of different methods against the background of the field experiments which have been proposed. Apart from laboratory estimations of manurial contents, it would appear that chief attention should be given to determinations of exchangeable cations calcium carbonate, pH value, salt contents, clay contents and moisture relationships as factors with a direct bearing on soil productivity. Attention has been drawn to the fact that in India there is a dearth of modern scientific equipment for the laboratory study of soils. There are, for instance, comparatively few photo-electric calorimeters available for the routine determination of phosphate and other soil constituents. Particular reference has been made to the value of spectrographic outfits in the study of problems of both plant and animal nutrition, and the suggestion is made that each Province and major State should endeavour to add as soon as possible a spectrographic outfit to the equipment of its chief agricultural research centre. Consideration should also be given to the possibility of using X-ray methods for the study of clay fractions at selected centres.

Staffing.—No less important than the appointment of directors of research and directors of extension work for each major area, such as a Province or a State, is the need for ensuring that these directors will have adequate numbers of well qualified staff under them. There is, in my opinion, a very great need for improving the status and salary of members of the staffs of agricultural departments in India. On tour, I did not consider that I was over-paying my personal bearer, but I found nevertheless that I was paying him more than many an agricultural graduate was receiving as a salaried member of an agricultural staff. In the absence of improvements in both salaries and status I fail to see how it will be possible in the future either to attract recruits to, or indeed hold in the service, men of the mental calibre needed to solve the many problems of agriculture. Apart from the question of improving salaries and status, there is also a need for increasing the numbers of both research and extension staffs. Without exception, the provincial or state agricultural department staffs are quite inadequate in number to permit of touching more than the fringe of the problems requiring attention. Another factor which should be borne in mind in the recruitment of staff, is the desirability of making as many as possible of the appointments permanent, after a reasonable probationary period of a few years, to ensure that the probationer is indeed qualified for and fit to undertake the work required. Short term work and temporary appointments cannot be expected to produce contented and efficient workers. As already indicated, one of the weaknesses of field experiment work in the past has undoubtedly been the fact that such work has had to be undertaken as an incidental duty by numerous individuals, who had many other duties expected of them. If a basis of sound information is to be built up in a reasonable time, one of the first essentials is realization of the need for whole-time field experiment assistants.

One of the incidental effects of scientific advance in the past two decades has been the need for corresponding changes in the curricula, training and out-

look of students qualifying for degrees either in pure science or in agriculture. A modern graduate in agriculture has of necessity to assimilate uncritically knowledge on a wide variety of subjects. Knowledge of this type is of great value and is indeed essential in many aspects of extension and general agricultural work. The University or College training of such a graduate, however, does not develop in him the critical faculty, and, except in special cases where a man may have a flair for research which no amount of training can ever give, the general graduate in agriculture is not likely to make a good research worker or experimentalist. By virtue of the more intensive training which he receives, a graduate in any of the pure sciences has his critical faculty more fully developed and is, therefore, likely to become a better research worker than the ordinary graduate in agriculture. Whereas it is extremely difficult to instil scientific principles into the latter, it is relatively simple for an able science graduate to acquire an adequate agricultural background to enable him to understand the problems of agriculture and appreciate the needs of extension work. I suggest, therefore, that in the future more attention should be given to the agricultural service of graduates in pure science.

ANNEXURE VI

Training of students abroad (Three Years .)

	1st year		2nd year.		3rd year		Total	
	A	B	A	B	A	B	A	B
Agriculture	57	37	42	37	32	...	121	74
Animal Husbandry (including dairying)	20	25	28	24	12	...	50	49

A.—Centre . . 171
B.—Provinces . . 123

CHAPTER IV.

Training of health personnel.

By

K. C. K. E. RAJA.

Introduction.—This note consists of two parts. Part I presents a brief survey of existing training facilities in medical and certain allied fields as well as of proposals for the training of health personnel which are included in the five-year plans put forward by Provincial Governments. Reference is also made to the development of medical colleges in certain Indian States. In Part II are given a number of new proposals for increasing the rate of production of health personnel over and above that achieved by the measures indicated in Part I of this note. The directive given to the Scientific Manpower Subcommittee requires that the proposals incorporated in Part II should be capable of being initiated within the next six months. While this has been kept in mind, it has not been considered desirable to permit that a narrow interpretation of it should lead to the exclusion of certain proposals of importance, the implementation of which might not be started within the next six months, although certain preliminary investigations in relation to them can and should be carried out within that period.

It cannot be emphasised too strongly that the proposed development of training programmes for scientific personnel requires the simultaneous promotion of schemes for the utilisation of their services. Failure to provide such measures as are necessary to facilitate their employment after training will have disastrous results. For instance, even in 1938, in spite of the fact that there had been no determined effort to expand the training of doctors on a large scale, the Director General, Indian Medical Service, pointed out in his Indian Medical Review that "unemployment has become a serious problem among the younger members of the profession".

PART I.

It may be mentioned that part of the information given here is based on the five-year plans for health development put forward by Provincial Governments. These plans were originally framed by the Adviser Governments in the provinces and popular Ministries, after they took over, have been revising these plans partly to fit in with the new policies they are enunciating and partly as the result of the decisions reached at the Health Ministers' Conference held in October 1946. It is understood that certain provinces have appointed Special Health Reorganisation Committees which have been actively considering the previous five-year plans and it is not possible to state to what extent these plans will be modified by the Committees concerned. The figures given in this note may therefore undergo some changes but it is hoped that they will nevertheless, provide a basis for the discussions of the Scientific Manpower Committee.

Undergraduate Medical Education.—A list of medical colleges and of schools is given below. Some of the schools are in the process of conversion into colleges, e.g., those in Orissa and Sind. But conversion is not complete and these institutions are shown as schools and not as colleges. Certain Provincial Governments have, as part of their postwar development programme, planned the establishment of new medical colleges. Similar developments are taking

place in some of the Indian States also. The information available from provincial five-year plans and from other sources is summarised below:—

Province	Number of existing colleges	Number of schools	Number under conversion into colleges or proposed to be converted within five years	Number of new colleges proposed
1. Madras	4	Nil	Nil	2
2. Bombay	2	4	2	Nil
3. Bengal	2	9	2	1
4. C.P.	Nil	1	Nil	
5. Orissa	Nil	1	1	Nil
6. Bihar	1	1	1	1
7 U. P.	2	Nil	Nil	1
8. Punjab	3	2	Nil	(1 Medical School for women)
9 Sind	Nil	1	1	Nil
10. Delhi	1	Nil	Nil	
11. Assam	Nil	1	1	Nil
12. N. W. F. P.	Nil	Nil	..	1
Indian States—				
1. Mysore	1	1	1	Nil
2. Hyderabad	1	Nil	Nil	Nil
3. Jaipur	Nil	Nil	Nil	1
4. Gwalior	Nil	Nil	Nil	1
5. Baroda	Nil	Nil	Nil	1
6. Indore*	Nil	1	1	Nil

In addition to these, it has been proposed that medical colleges should be established at Aligarh and Benares. These will have to be financed largely by the Central Government. As regards Aligarh it is understood that a sum of about Rs. 50 lakhs has already been collected by the University authorities and the possibility of its establishment has therefore been strengthened.

The numbers passing out from existing medical colleges and schools are approximately 1,000 graduates and 800 licentiates per year. Provincial programmes provide for the establishment of six new medical colleges and of a medical school for women, the conversion of nine medical schools into colleges and various improvements to existing colleges and schools within the next five years. In addition five more colleges are likely to be functioning in Indian States during the same period. The Bhore Committee recommended for the first five years seven new colleges, the conversion of eight medical schools and improvement and extension of existing colleges so as to enable them to admit 100—120 students a year.

The number of annual admissions in the proposed new colleges will fall far short of 100, they being nearer 50 in most cases. The following are the figures available for admission in the new colleges in Indian States:—

Jaipur	50
Gwalior	35
Indore	50
Baroda	50

*This is not maintained by the State but by a Committee over which the Resident to Central India States presides. There is a proposal to convert it into a college with financial support from a number of States in Central India and Rajputana admission being reserved to the candidates nominated by each of these States. Without support from the Central Government this conversion is not, however, likely to take place.

In the case of the proposed new colleges in the provinces and of those schools which are being raised to colleges complete information regarding annual admission is not available. From such figures as are known the annual rate of admission is not likely to exceed 50 in each case. Conversion has started at varying dates in respect of individual medical schools. However, as the medical course extends over a period of five years, the contribution made by these institutions in the way of qualified medical practitioners will be negligible during that next five years. New medical colleges will also make no contribution during the same period. During the next quinquennium, taking the average annual admission to each of these new and converted colleges at 50 and the average number qualifying each year as 80 per cent. of the annual number of admissions, the 20 new or converted institutions in India (15 in British India and five in Indian States) will together provide some 800 additional medical graduates annually.

It must at the same time be remembered that the production of licentiates at the converted institutions will have ceased during this period, so that the total number of doctors passing out annually will not materially alter unless other steps for raising production can also be undertaken. The proposal of the Bhore Committee to increase the intake of a medical college at least to 100 candidates per year will, when applied to existing and new colleges, provide for the admission of about 3,700 students and the passing out of some 3,000 medical graduates every year.

Postgraduate Medical Education.—The following quotation from chapter XIII of Volume I of the Bhore Committee's report sums up existing facilities in the country:—

> "The existing facilities for postgraduate education in the different medical colleges are few. Recently there has been a great deal of activity shown by most universities in the institution of postgraduate degrees and postgraduate diplomas without, however, providing in every case the necessary facilities for adequate instruction in the subjects concerned. Madras is, in this connection, an exception. There are two university diplomas, one in Obstetrics and Gynæcology and the other in Ophthalmology, and the training, which is in both cases for a period of one academic year, is imparted in the special hospitals concerned. Government diplomas also exist in the specialities of Tuberculosis, Radiology and Clinical Laboratory Sciences with adequate provision for the training of students in these subjects. Courses for Diplomas in Public Health and in Maternity and Child Welfare are given at the All-India Institute of Hygiene and Public Health, Calcutta, as well as shorter courses in certain branches of public health work. For the Diploma in Public Health the Institute is affiliated to the Calcutta University. The Universities of Bombay and Madras also award a similar diploma, the one granted in Madras being known as the Bachelor of Sanitary Science (B.S.Sc.). Facilities for the required training are available at the Grant Medical College, Bombay, and at the Madras Medical College. In addition, the University of Calcutta grants a Doctorate of Science in Public Health (D.Sc.) and the University of Bombay a Doctorate in Hygiene (D.Hy.) Regular postgraduate courses are also provided in the School of Tropical Medicine at Calcutta.
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> "In certain universities the degrees of M.D. and M.S. provide for specialisation in such subjects as Ophthalmology, Bacteriology, Anatomy and Physiology. Research degrees have also been instituted in some universities in the non-clinical subjects of Anatomy, Physiology, Pharmacology, Biochemistry, Pathology and

Bacteriology. The diplomas, that have been instituted in the different universities, include the following subjects:—

Ophthalmology,
Psychological Medicine,
Radiology,
Pediatrics.
Oto-Rhino-Laryngology,
Venereology,
Orthopædics.
Obstetrics and Gynæcology.
Dermatology,
Tuberculosis.
Anæsthesia.

"As has already been pointed out, in many cases proper instruction courses in these subjects have not been organised at the different centres where such special degrees or diplomas have been instituted by the universities concerned. When such training facilities become available, there should be wide scope in the country for specialisation on satisfactory lines.

"No organisation to co-ordinate and foster postgraduate education exists in any of the universities, except Madras where a Council of Postgraduate Medical Education has recently been formed. It is understood that a proposal for the institution of a similar organisation is under consideration in the universities of Bombay and Calcutta."

The provision of adequate facilities for postgraduate education is vital to the development of medical education in India. The teaching staff of existing colleges are inadequate in relation to the number of students and an increase in the number of admissions to these colleges as well as the establishment of new institutions can proceed with reasonable speed only if a large number of trained teachers is made available. A satisfactory approach to the problem appears to be by the provision of an overseas postgraduate training programme and by the simultaneous development of facilities in India.

Overseas training programme.—Forty-nine candidates were selected in 1946 and have been working in different institutions in the U.K. and U.S.A. for some months. All these are for training in medical subjects. In 1947 the scope of the scholarship scheme was extended in order to include dentistry and nutrition and the following numbers have been selected:—

Medical subjects	82
Dentistry	13
Nutrition	10
	105

In view of the limited number of seats which foreign countries are able or willing to place at our disposal because of their own postwar needs, the authorities in those countries have, generally speaking, agreed to give us as many seats as can be spared and they desire that the best candidates available should be selected for placement in their institutions. It is also to the advantage of India that the limited facilities thus secured should be utilised by candidates chosen through a process of careful selection and that the field of choice should be as extensive as possible. Therefore Provincial Governments, Indian States and the different Departments of the Government of India have all been brought into the scheme. Selection is carried out by a Central Selection Board appointed by the Health Department of the Government of India.

Development of postgraduate training facilities in India.—The Health Survey and Development Committee (the Bhore Committee) put forward three sets of proposals:—

(1) the establishment of an All-India Medical Institute which will provide undergraduate and postgraduate training of a high order in medical and certain allied subjects with due emphasis on research (in the laboratory and in the field into community health problems) by every Department of that Institute;

(2) the development of training and research facilities in particular subjects in existing centres of teaching in the provinces with a view to making these enlarged facilities available not only to the provinces concerned but also to other parts of India and

(3) the establishment of special institutions for diseases such as leprosy, filariasis or kala-azar which have a definite geographical distribution in each case; the location of such institutes will obviously be determined by the availability of suitable clinical material in abundance.

The creation of an All-India Medical Institute has been actively under consideration by a special Committee appointed by the Government of India. It is understood that, in addition to putting forward proposals regarding the Institute, this Committee has emphasised the importance of a speedy development of training and research facilities in particular subjects at suitable medical colleges in order to make such facilities available to the country as a whole and has suggested that a special Subcommittee should be appointed to visit medical colleges and submit a report on the proposed developments. The reports on the All-India Medical Institute and on the suggested expansion of provincial medical training centres should, when they become available, prove to be of great value to the Scientific Manpower Committee.

Co-ordination of internal and external training programme.—The need for co-ordination of internal and external facilities for postgraduate medical education was stressed by the Central Selection Board in its report to the Government of India in 1946. The Board has pointed out that, as a result of its examination of the candidates it interviewed it has "come to the conclusion that there are a number of persons who, by their record of undergraduate medical training, give reasonable promise of high performance in specific fields but have not yet attained, through adequate postgraduate training and experience, that level of achievement which it considers necessary for students who are to be sent abroad." After recommending that existing centres for postgraduate training in specific subjects in different parts of the country should be improved and enlarged to admit students from all parts of the country, the Board recommended that "a scheme of scholarships should be instituted in order to assist promising young medical graduates to undergo the training offered in these institutions."

Public Health Training for Doctors and Certain Higher Type of Personnel.—The proposals of the Bhore Committee for the reorganisation of undergraduate medical teaching will, if adopted, provide a type of doctor whose training will include most of the preventive health teaching now given as part of the postgraduate course for the Diploma in Public Health (D.P.H.). The Committee says "Postgraduate training in preventive and social medicine will then have, as its objective, the provision of facilities for advanced training in such branches of the subject as malariology, maternity and child welfare, industrial hygiene, public health administration, epidemiology, public health laboratory practice and statistics. Such specialised training may be of two types. The first will be of a limited character and will have as its purpose the equipment of health workers with a reasonable measure of proficiency in these subjects. This course

of instruction may, it is suggested, ordinarily range from about three months to one year. The second will be for those who desire to attain the status of specialists in each of the abovementioned branches of preventive health work. For them we suggest that the period of training should be about three to five years."

With this background of the recommendations of the Bhore Committee existing facilities for postgraduate training of higher types in preventive health work may be examined.

All-India institute of hygiene and public health, Calcutta.—This is the most important institution in India for the training of higher types of public health personnel. The institute consists of the following teaching sections:

(a) Public health administration;

(b) Epidemiology;

(c) Microbiology;

(d) Biochemistry, Nutrition and Physiological hygiene;

(e) Sanitary engineering;

(f) Maternity and child welfare and

(g) Statistics.

Each section is under the charge of a Professor assisted by a number of gazetted and non-gazetted officers under him.

The Degrees and Diplomas for which students are trained at this institute and the special courses available in the institute are:—

(a) Doctorate of Science in Public Health;

(b) Diploma in Public Health;

(c) Diploma in Public Health and Hygiene;

(d) Diploma in Maternity and Child Welfare and

(e) Certificate course of three months' duration in the subjects of maternity and child welfare, industrial hygiene, nutrition, laboratory technique and biometric technique

Training courses for doctors for general public health work, which are available in other parts of India, have been referred to in the latter part of para. 1 of the extract from Chapter XIII of Volume I of the Bhore Committee's Report, which is given on page 5 of this note.

The Training of Lower Types of Public Health Personnel.—Under this head three classes of workers are considered here, (1) midwives, (2) health visitors and (3) public health or sanitary inspectors.

Midwife.—The number of practising midwives in the country is estimated at 5,000 while, on the basis of about 10 million births each year in British India, the number required for providing adequate service to the people is 100,000. Provincial five-year plans do not in all cases give the number to be trained each year but, from such information as is available, it is considered that the number of newly qualified midwives each year will not exceed a few hundreds.

Health Visitor.—The health visitor is a fully trained midwife, with additional training in preventive health work which, in different institutions, varies from 9 months to a year and a half. She has normally no training in nursing. The health visitor has been mainly employed in this country in maternity and child welfare work.

The total number of health visitors available in India is estimated at about 750—800. Complete information regarding the proposed training programmes

for health visitors in the provinces is not available. Madras will train about 100 health visitors each year while an unstated number will be trained in Orissa and in the United Provinces. The annual output of health visitors in India as a whole is at present about 60. It is considered that at least one health visitor will be required to supervise the work of five midwives or the eventual requirement of the country will be about 20,000.

Public health or sanitary inspectors.—The existing output of qualified public health inspectors in India is about 200 per year. The majority of the provinces are making provision for the training of these inspectors although the number to be trained each year has not been stated in many cases. The present number under employment is probably 3,000 while British India requires a minimum of 12,000 public health inspectors.

Nursing.—The total number of qualified and practising nurses in India is estimated to be about 7,000, which gives a ratio of 1 to 43,000 of the population as against 1 to 300 in the U. K. and 1 to 357 in the U.S.A. The Bhore Committee suggested that a ratio of 1 to 500 should be attained in India by 1971, which will mean a hundredfold increase. Provincial plans do not give a clear indication of the provision made for expansion of nursing services and, in many cases, the exact number likely to become available is not readily seen. From such information as is available the total annual output is not likely to exceed four to five hundred from the fourth year of the training programme. The normal training course for a Certificate in Nursing is 3 years. There are Junior and Senior Certificates in Nursing, the type of qualification being dependent on the basic educational standard of the candidates.

The national health programme requires two types of nurses (1) the person trained principally for nursing the sick and (2) the individual who, in addition to training in sick-nursing, is equipped for preventive health work in a variety of services as school health, tuberculosis and venereal diseases. The former will be mainly employed in hospitals and other institutions for the skilled nursing of patients while the latter, who is known as the public health nurse, will be employed essentially for the development of a combined curative and preventive health service in the homes of the people. The nursing which the public health nurse will be called upon to do will not be of the same high order as that which the hospital nurse will carry out, while along with such duties she will have to perform, as has already been pointed out, various preventive duties in the homes she visits. The public health nurse does not exist in India today.

The Nursing College.—Last year the Government of India started a Nursing College in Delhi. It provides three types of courses:—

(1) a four-year course leading to B.Sc. (Hons.) in Nursing of Delhi University;

(2) a Nursing Administration Course lasting 8 months and

(3) a Sister Tutor's Course covering a period of nine months.

The last two are for qualified nurses and, on passing, the candidates are given certificates issued by the Government of India.

The B.Sc. (Hons.) course lays emphasis on preventive health work and the candidates who qualify will be public health nurses. The second course is for qualified nurses and is intended to provide suitable candidates for administrative posts either in hospitals or in the nursing service of the provinces. Sister Tutor are fully trained nurses, who after undergoing the course will be able to undertake the training of pupil nurses.

Training facilities in Certain Special Fields—

(a) *Malaria—Malaria Institute of India.*—At this institute in normal years, two training courses, each of six weeks' duration, are held for doctors, one for malaria inspectors (who are usually qualified sanitary inspectors or those who

have done antimalaria work for some time) and for engineers in malariology. The annual numbers trained are roughly 50 medical men (graduates and licentiates), about 25 inspectors and 30 engineers.

(b) *Tuberculosis (T.D.D. course).*—A nine months' course financed by the Government of India for special training in tuberculosis for medical graduates has been started this year under the auspices of the Delhi University. Similar courses exist at present in Madras and Mysore. The Tuberculosis Association of India has sent an appeal that other universities should also start such courses and in particular the universities of the Punjab and Bombay.

(c) *Leprosy.*—Under the auspices of the Indian Council of the British Empire Leprosy Relief Association a special training course for doctors has been held annually at the Calcutta School of Tropical Medicine. The period of training used to be two weeks but it was extended to four weeks in 1946 in order to make the course fuller. The number of doctors attending the course varied from 15 to 22 during the years 1944—46.

(d) *Nutrition.*—Reference has already been made to a three-months' training course in nutrition in the All-India Institute of Hygiene and Public Health, Calcutta. A nutrition course has also been held every year since 1937 at the Nutrition Research Laboratories at Coonoor except in 1943 and 1946 when no training was done. The normal period of the course is 10 weeks although in 1942, 1944 and 1945 it was curtailed for special reasons. Students attending the classes have in the majority of cases been employees deputed by Provincial and State Governments and those trained at Coonoor are now working as full-time Nutrition Officers in Baroda, Hyderabad (Deccan), Bihar, the Punjab and in certain other Provinces and States. In 1947, in addition to the usual 10-weeks' course, a special course of 8 weeks for nursing sisters, health visitors, teachers, labour welfare officers and others was also held. The number of candidates attending the courses varied, between 1937 and 1947, from 7 to 29.

Lake Medical College, Calcutta.—In order to enable medical licentiates with war service to acquire the degree qualification the Government of India has started a medical college in Calcutta. It is proposed to take, every six months, 150 candidates and to give them 18-24 months' training which, under the special concessions granted by the Medical Council of India, enables them to take the M.B.B.S. The scheme is now sanctioned for a period of five years.

Dental Education.—Both as regards undergraduate and postgraduate education dental training in India is far behind medical education. There is only one dental college which offers training on the university standard and it is located in Lahore. The Calcutta Dental College, which was the first to be established in the country and which came into being through voluntary effort, is housed in a rented building which requires extensive repair. Augmentation of staff and personnel is also necessary to improve the institution to a desirable level. Similarly the Nair Dental College at Bombay, which has also helped to spread dental education in India for many years, requires assistance to raise its level of efficiency. The ultimate objective should be to provide, as in the field of medical education, adequate facilities in the country for undergraduate and postgraduate dental training. In the immediate future the upgrading of the two institutions in Bombay and Calcutta should receive attention, they being raised to the university standard of teaching and affiliated to the Universities of Bombay and Calcutta respectively.

The number of qualified dentists practising in the country is estimated at 1,000. In the West a ratio of one dentist to 3,000 inhabitants is not considered sufficient. In India, as the incidence of dental caries is relatively less, a lower ratio of 1: 4,000 seems permissible as the objective to be aimed at. On this basis British India will require about 92,500 dentists for an estimated population of 370 millions in 1971.

Pharmaceutical Education.—Three types of training are available, (1) the training for compounders, (2) the chemists and druggists qualification and (3) a college education leading up to a degree in pharmacy. The preliminary qualification required for entrants into compounders' class varies, in the provinces, from the middle school to the high school standard. The period of training also varies from one to two years. A period of practical training in a chemist's or druggist's establishment or in a hospital is included.

The preliminary educational standard required for the chemists and druggists course is the Matriculation or School Leaving Certificate. The period of training lasts two and a half years.

As regards collegiate education the following extract from page 174 of Vol. I of the Bhore Committee's report states the present position:—

> "This is designed to turn out a class comparable to the graduate pharmacists or pharmaceutical chemists found in Europe and America. The Benares Hindu University was the first to inaugurate a course of this kind in 1934 and, since that time, other universities have also provided similar training facilities. The Andhra University instituted the study of 'Pharmaceutics' as a special subject in the curriculum for the B.Sc (Honours) and M.Sc. Degree in Chemical Technology. The Calcutta University has a course in Pharmaceutical Chemistry for M.Sc. students. The Bombay University has opened a new course in Pharmaceuticals in their technological Faculty. The Madras University has inaugurated a two years course, B.Sc. (Pharm.), for which students who have passed the Intermediate examination in Science are eligible. Thus graduate instruction in pharmacy is of two types, one which deals mainly with the technical side of it and the other which stresses the pharmaceutical side."

In the preceding paragraphs certain estimates of existing numbers of different types of health workers and the targets to be achieved in each case have been discussed. These estimates are those put forward by the Bhore Committee. For the sake of convenience the information is given below in tabular form:—

	Estimate of existing number	Number considered desirable	Approximate rate of increase required
1. Doctors	47,000	185,000	4 times.
2. Nurses	7,000	740,000	106 times.
3. Dentists	1,000	92,500	92 times.
4. Midwives	5,000	100,000	20 times
5. Qualified Pharmacists (University standard).	75	672,000	827 times.
6. Public health inspectors	3,000	12,000	4 times

PART II.

Proposals for enhancing the rate of production of health personnel.

The proposals included here are intended to supplement the production of health personnel resulting from the five-year plans of Provincial Governments and the training facilities of existing institutions, which have been briefly surveyed in Part I of this note.

Undergraduate Medical Education.—It has already been shown that some 800 medical graduates are likely to be produced annually after a period of five years, *i.e.*, the present annuol output of about 1,000 graduates is likely to be increased by 80 per cent.

Two methods seem possible to enhance still further the rate of production of doctors, namely, (1) the application of the double shift system of teaching and (2) the improvement of existing colleges so as to permit of each taking 100—120 students each year.

The double shift system.—This system requires an adequate supply of teachers and an enlargement of laboratory and other teaching facilities, including an increased number of hospital patients for teaching purposes. These conditions are most likely to be satisfied in Calcutta, Bombay and Madras. Therefore a reference was made to the Surgeons Generals of these three provinces regarding the possibility of developing a double shift system of training in the medical colleges in each of these three cities. The reply from Madras was definitely against the starting of the double shift system while the Surgeon General, Bengal, has agreed to try it out in the Calcutta Medical College and thereby increase the annual intake of students by 50 per cent. of the existing rate of admission or by 55 students each year. The Surgeon General of Bombay has stated that the introduction of the double shift system is not possible in the Grant Medical College but that the position in G. S. Medical College is somewhat brighter and that the Dean and his professors think it is possible if more accommodation can be made available through the provision of a third floor to the present college building and the acquirement of the adjoining Veterinary College, which is about to be abandoned, and if beds can be provided at the ex-Military Hospital at Dharavi. The proposal requires, however, careful consideration before it can be accepted as a practical proposition.

In the circumstances stated above there seems to be little possibility of utilising the double shift system for promoting a marked rise in the rate of production of doctors, at least in the near future. Nevertheless, it seems desirable to try out this system at Calcutta and, if possible, at Bombay because the experience gained can be utilised later in other places also.

Improvement of existing Colleges.—Existing colleges are, in many cases, deficient in accommodation, equipment and staff and the Bhore Committee has recommended the improvement of these colleges and a raising of their rate of annual admission to 100—120 students per year. While a few colleges have at present this rate of admission others fall short of it. The Committee has recommended that all the existing colleges should undergo the necessary improvements within a period of 10 years (see tables on pages 330 and 331 of Volume III of the Bhore Committee's report). Of these colleges two belongings to the Punjab fall in Pakistan. In British India the remaining colleges number 14. The estimated expenditure for improvement and expansion of these colleges which are in "India" and in Pakistan respectively is shown below:—

India—

14 colleges	Recurring	Rs. 115·5 lakhs.
	Non-recurring	Rs. 432·0 lakhs.

Pakistan—

2 colleges	Recurring	Rs. 16·5 lakhs.
	Non-recurring	Rs. 54·0 lakhs.

At a uniform rate of annual admission of 100 students per year in each of the 14 medical colleges the number of qualified medical graduates produced each year will be 1,120. If the admission rate can be raised to 120 the number of

qualified medical graduates will be about 1,350 per year. If the two colleges in Lahore are also included, the total number passing out each year will be 1,280 if the rate of admission be 100 and about 1,530 if it be 120.

In the case of the new colleges it is better to await the completion of their development before the question of expanding their capacity for intake is considered. At present many of the existing colleges and their associated hospitals are deficient in respect of accommodation, equipment and staff and any funds that are available would be spent more usefully on their improvement and expansion rather than on the enlargement of the colleges that are now coming into existence.

Improvement of undergraduate training in preventive medicine and public health practice.—The Bhore Committee pointed out that the development of future health services in India should lay emphasis on the preventive aspect of medical practice. The Committee has therefore suggested the creation of a Department of Preventive Medicine and Public Health in all medical colleges, the provision of facilities for training in rural and urban public health practice to the undergraduate medical student and the introduction of extensive changes in the teaching of the subject. The purpose in view is to familiarise the student, early in his career, with environmental and other factors associated with the problem of ill-health, to develop in him the preventive outlook and to provide opportunities for his active participation, even as a student in community health work. The urban and rural health organisations, which will be associated with the proposed Department of Preventive Medicine and Public Health, will also serve the purpose of enabling the different departments of the college to promote research into community health problems as well as to attempt the practical application of the fruits of research. The developments are bound to influence the student profoundly, to stimulate a spirit of observation and enquiry and to promote the growth of a scientific outlook in him. The services of trained medical social workers are required for the teaching of preventive medicine on the lines indicated above. Recently the training of such social workers has, it is understood, been started in Bombay at the Tata Institute of Social Studies and, later in this note, a proposal has been included for securing a steady supply of trained social workers in the medical field. It is proposed that the opening of this department should now be limited to (a) the Madras Medical College (b) the Grant Medical College, Bombay and (c) the Calcutta Medical College.

Postgraduate Medical Education.

Development of training facilities in special branches of medicine in existing institutions.—Reference has already been made to a proposal for the establishment of a small Committee to visit the more important medical teaching centres in the country and to report on the steps to be taken to promote the development of existing postgraduate training facilities in special branches of medicine in a manner designed to serve the needs not only of the province concerned but also of others. No time should be lost in the formation of this Committee and it should be asked to complete its task in a period of about three months. It would be desirable to employ the members of this Committee on a full-time basis during the period in order to ensure the speedy submission of its report. The report should give sufficient details regarding the financial implications of the proposals in order to enable Government to take early decisions regarding their acceptance and implementation.

Scholarships for Postgraduate Training in India.—Reference was made to the recommendation of the Central Selection Board that a scheme of scholarships should be instituted in order to assist promising young medical graduates to undergo postgraduate training in suitable centres in India. The Board considered that "a combination of provision in India for the immediate needs of the medical student after graduation and of a programme of studies abroad for candidates selected from among those who have undergone the courses available

in India would be essential to ensure the success of the health development schemes actively under consideration by the Central and Provincial Governments."

It is suggested that fifty scholarships of Rs. 100 a month per candidate plus tuition fees should be provided each year.

The All-India Institute of Hygiene and Public Health, Calcutta.—The different courses of training available at this Institute have already been indicated. Two tabular statements are attached which show what increase is possible in the number of admissions to each of the existing courses (Table A) and what new courses can be introduced (Table B) provided an adequate expansion of space, equipment and staff is made available.

In addition to the courses of training mentioned in these two tables reference should be made to certain other developments which are desirable. The prospectus of the Institute provides for the admission of research students on the payment of a fee of Rs. 250 per year. Although the Institute has been in existence for about 15 years there has hardly been any request for admission as a research student. On a discussion with the Director and the Professors of the Institute the opinion was unanimously expressed that it was essential not only to exempt research scholars from the payment of fees but also to give them a stipened. The scholarship scheme outlined in a previous paragraph should make it possible to select and place suitable candidates in the different sections of the Institute for definite periods of training, during which they can be made to participate in special investigations in the field and in the laboratory.

Another type of trainee should be the postgraduate worker who proposes to specialise in such subjects as a epidemiology, maternity and child welfare work and public health laboratory practice. As has been pointed out by the Bhore Committee (para. 84 on page 383 of Volume II of the report) that the period of training will have to be for about three to five years, the candidate participating in the teaching, research and administrative activities of the department. Persons so trained will be suitable for teaching posts in the Department of Preventive Medicine and Public Health in medical colleges and for the more responsible posts in health departments. If a man is to devote himself to such prolonged study it is essential that he should be free from financial embrassment and that he should be sure of obtaining a suitable post after his training is completed. It is therefore desirable that suitable candidates should be selected by Governments either from their own servants or from outside and sent to the Hygiene Institute with adequate provision for financial aid during training and with the assurance of a suitable post if the programmes of study are completed satisfactorily.

It is important to remember that quality is as important as quantity and that the need for the production of an adequate number of teachers and of capable administrators is great if the development of the health programme is to proceed on sound lines.

In connection with the proposed expansion of training facilities the Director of the Institute has stressed the importance of providing increased floor space for teaching and laboratory work and of residential accommodation for students at Calcutta and for students and staff at the Singur field training centre. Provision for these are included in the estimates of cost appended to this note.

Another important advance which is necessary is the setting up of a Food Technology Section in the Institute. The Departments of Microbiology, of Biochemistry and Nutrition and of Sanitary Engineering should participate in the development of the proposed new Section. While the enforcement of Food Adulteration Acts has resulted in the development of chemical standards of purity for food, the working out of bacteriological standards suitable for Indian conditions, which are particularly important in respect of milk and milk

products, has hardly been done. Moreover, from the point of view of food transport and preservation a combined attack on the associated problems by bacteriologists, chemists, nutritionists and public health engineers is necessary. Preliminary investigations by the three Departments of the Institute mentioned above will be necessary and it is suggested that such investigations should be initiated without delay. It is difficult to give a budget for the proposed expenditure but the need for promoting co-ordinated work in the field is urgent.

Dental Education.—The immediate need is to raise the Calcutta Dental College and the Nair Dental College, Bomay to the university standard and to get them affiliated to the universities of these two cities. During a recent visit to Calcutta the authorities of the Calcutta Dental College were interviewed as well as the Planning Officer in the Office of the Surgeon General, Bengal, who has been in close touch with these authorities for investigating the possibility of raising the standard of the college. The college is housed in a rented building which requires extensive repair. Considerable expenditure on equipment will also be necessary. Two schemes have been prepared by the authorities in consultation with the office of the Surgeon General, an Interim scheme and a Permanent Scheme. The former is based on securing the existing building on a lease from the landlord and on carrying out all the necessary repairs and improvements. The Interim Scheme will permit of the annual admission of 25 students for the degree course (B. D. S.) from July 1948 if the necessary equipment and staff can be secured and repairs carried out. The present course for 25 students undergoing the L. D. S. course will continue. The Permanent Scheme provides for a Dental College built on a proper site and capable of admitting 100 students per year on the lines of the recommendations of the Bhore Committee. The site on which the college now stands is too small to permit of the development of a college capable of admitting 100 students each year. The estimates of cost are as shown below:—

	Recurring (in lakhs)	Non-recurring (in lakhs)
Permanent Scheme—	5·00	25·00
Interim Scheme—	1·49	1·69

It seems fairly certain that the larger permanent scheme is bound to take some years to materialise and, in the meantime it is highly desirable that the Interim Scheme should be proceeded with.

It is not possible to give similar estimate for the Nair Dental College at Bombay because there has not been sufficient time to visit the institution or collect the necessary information. This college at Bombay and the Calcutta Dental College have, as has already been pointed out, led the way in the development of dental education in India and have worked for years with all the handicaps of insufficient financial support. Provision on the basis of the Interim Scheme in Calcutta would seem to be justified for the Bombay institution.

The Nursing College, New Delhi.—The present strength of the different classes in this institution (1947-48) and the targets which can be attained within the next four or five years if additional space, equipment, and staff can be made available are shown below. At present, the majority of the professional posts remain unfilled in spite of constant effort at recruitment. This position should be rectified as soon as possible. The present sanctioned strength of the teaching and administrative staff and the expansion necessary

for increasing the intake of pupils are shown below. These figures have been received from the Principal of the College:—

Course of training	Present Strength (1947-48)	Target at the end of 4 to 5 years.
(*a*) B. Sc. I Year	20	30 a year for each of the four years of the course = 120
II Year	8	..
(*b*) Nursing Administration	6	15
(*c*) Sister Tutor	6	30
(*d*) Public health course for qualified nurses (2 years).	25 a year	50
(*e*) Supervisors for specialities such as paediatrics, orthopaedics etc.	..	10
(*f*) Dietetics course	..	25
(*g*) Preliminary Training School Course	25	50
Total	65	300

STAFF

Teaching & Administrative—		
Senior staff	6	11
Junior staff	11	24
Total	17	35
Other staff—		
Librarian	1	2
Clerks	3	10
Domestic servants	40	100
Total	44	112

ESTIMATES OF EXPENDITURE

Recurring cost.

1947-48. . . . . Rs. 1·327 lakhs.
At the end of 4-5 years. . . . . Rs. 2·795 lakhs.

Some of the teaching at the college is now done by the university. If the College is required to employ whole-time staff for all the subjects in the curriculum, the figures given above will have to be revised.

Non-recurring expenditure.

	1947-48	At the end of 4—5 years.
Equipment	Rs. 40,000	Rs. 1 lakh
Building	At present the college is housed in war-time barracks.	A rough estimate of the cost of new buildings for the college is Rs. 75-80 lakhs.

Nursing is a subject which has been considerably neglected in the past and it is essential that early steps should be taken to expand the training, facilities at the Nursing College without waiting for the construction of a new building, which might cost as much as Rs. 75-80 lakhs. The present war-time barracks in which the college is housed have been fully occupied and an expansion of

the training programme on the lines suggested will require more accommodation. Constitution House is adjacent to the Nursing College and it is for consideration whether, as soon as the work of the Constituent Assembly is over, it cannot be made available for housing the college. The Principal considers that it would be desirable to move the college as a whole into the Constitution House instead of occupying a portion of it. Then the existing college buildings can be made available for other purposes.

The Lady Reading Health School.—This school trains at present batches of 12 pupils, who are qualified midwives, for undertaking the duties of health visitors, the period of training extending to 18 months. The entrants to the school receive their midwifery training in different institutions all over the country and a disadvantage is that the standard of education varies to some extent. It is understood that the Indian Red Cross Society, which maintains the School, has recently put forward a scheme to the Government of India for giving midwifery training also at Delhi. The number to be trained remains 12 and the average annual cost of the scheme, which is put forward for a period of three years, is Rs. 50,000. This appears to be too large an expenditure if the purpose served is only that of ensuring improved midwifery training. After discussion a revised scheme has now been prepared whereby it will be possible to admit 30 pupils for midwifery training and 25 for the course for health visitors, each of which lasts 18 months. The new scheme also provides for improved teaching in child health. The average annual expenditure required will rise to Rs. 71,000, an increase of Rs. 21,000, which would seem to be well worth while in view of the larger intake of pupils.

An obstacle to the expansion of training facilities in the past has been the inadequacy of housing accommodation for the pupils. This will have to be rectified. At present there is provision in the school building for 24 students (two batches of 12 will be under training simultaneously) and a room for the Matron. Under the proposed expansion room will be required for 110 students at a time, for two women doctors and four midwifery assistants. It is suggested that the possibility of securing W. A. C. (I) Hostels for accommodating the additional students and staff should be investigated

College of Pharmacy, Bengal.—The establishment of a College of Pharmacy in Calcutta has been under investigation for some time. The provision of a licentiate course in the subject of approximately two years' duration for those with Matriculation as general educational qualification and of a degree course of three years' duration for those with Intermediate in Science has been proposed. It has been suggested that it should be started on a modest basis on rented premises. The recurring expenditure is likely to be Rs. 1.25 lakhs and non-recurring (mainly for equipment) Rs. 2.0 lakhs.

The Tata Institute of Social Sciences.—The need for training medical social workers has already been stressed. The Tata Institute of Social Sciences appears to be the only place in India where such training can be given. A scheme offering twelve scholarships a year in order to provide for candidates sponsored by the Central and Provincial Governments is suggested. The course lasts a period of two and a half years and the value of the scholarships should be, the Director of the Institute suggests, Rs. 1,500 each year, including the annual tution fee of Rs. 250.

Proposals from the Provinces for raising the output of certain types of Health Personnel above the present level.—Provincial Administrative Medical officers of the Medical and Public Health Departments were asked whether training facilities over and above existing training courses could be made available in respect of such health workers as midwives, health visitors, health inspectors etc. and, if so, they were asked to indicate the expenditure which would be necessary. It

was made clear to them that the schemes should be capable of being initiated within the next six months. The replies received are tabulated below:—

United Provinces.

Additional numbers to be trained under double shift system.

Health inspectors	30
Health visitors	20
Midwives	30
Vaccinators	30
Laboratory assistants	30

Total grant required for one year is Rs. 40,000. This does not include provision for boarding and lodging arrangements for the students or examination fees.

Bombay—

	Present provision per year	Expected provisian in April 1948
Health visitors	20 (10 at Poona and 10 at Bombay Schools).	50 (20+15) at each of two new schools for Gujarat and Karnatak.
Health inspectors	125—150 (Bombay city).	325—350 (Two new centres of training are to be opened at Ahemedabad and Poona respectively)

Madras.

100 more midwives can be trained at a cost of Rs. 720 per pupil.

Bihar.

	Number that can be trained	Cost
		Rs.
1. Health inspectors	80	5,000
2. Vaccinators	480	27,000
3. Health visitors	12	30,000
4. Midwives.	12	20,000

Assam.

	Number that can be trained	Institutuon giving training	Grant required Recurring	Non-recurring
1. Malaria Inspectors	24	Malaria Section of the Public Health Department.	Rs. 2,000	Rs. 10,000
2. Laboratory Assistants	6			
3. Laboratory Technicians (six months' course).	12-24	Pasteur Institute, Shillong.	8,000	1,000
4. Vaccinators	60	Government Vaccine Depot, Shillong.	1,000	...

The increased out-put per year in respect of each type of worker for all the provinces together will be :—

(1) Health inspectors	260
(2) Health visitors.	62
(3) Midwives	142
(4) Vaccinators	570
(5) Laboratory Assistants	36
(6) Laboratory Technicians	12—24
(7) Malaria Inspectors	24

The total expenditure will be non-recurring Rs. 11,000 and recurring Rs. 205,000.

Reorganisation of Health Administration in Delhi Province and the establishment of the All-India Medical Institute.—These are long term plans but they are mentioned here partly because of their importance and partly because

of the need for keeping in mind the necessity for initiating action on them as early as possible. Further, as will be shown later, they are, to some extent, inter-linked and their development will, it is believed, constitute a great contribution by the Centre towards promoting interest in the country in the expansion of health services and in aiding medical education.

The Bhore Committee has recommended that the Central Government should develop Delhi Province as a demonstration area and that its plans and those put forward by other postwar reconstruction committees should be implemented simultaneously in order to make a determined effort to improve the life of the community. Making such a social experiment, methods suited to Indian conditions and to our resources will have to be developed if the purpose in view is to achieve lasting results and if the advance made in Delhi is to be reproduced in other parts of the country as well.

The All-India Medical Institute will help to demonstrate desirable standards of training in the medical and certain allied fields to the rest of India, besides producing a reasonable number of teachers, research workers and potential administrators in the field of health. This Institute will require urban and rural health organisations in which the practical training of its students can be carried out as well as research into community health problems. The reorganised health administration of Delhi Province can provide these rural and urban training facilities and thus it is of advantage to link the Institute and Delhi health organisation together.

From the point of view of securing suitable teaching personnel for the proposed All-India Medical Institute, the development of teaching and research departments in respect of specific subjects in selected medical colleges in different parts of the country must be started immediately. Delhi health reorganisation should also receive very high priority and it would be wise to remember that the establishment of the Medical Institute as early as possible would make a notable contribution to the efficiency of the Delhi health services as well as to the advancement of medical education in the country.

Estimates of Cost.—Rough estimates of the cost of many of the proposals put forward in Part II of this note are given in an appendix to this note. In certain cases no such estimates have been attempted partly because of the difficulty of making them at short notice. Further, certain measures such as the provision of rural and urban training fields in association with the Departments of Preventive Medicine and Public Health in the colleges at Calcutta, Bombay and Madras can be carried out as part of the provincial plan for expansion of health services and it has not therefore been considered necessary to make specific provision for such organisations in the attached estimates of cost.

APPENDIX

Approximate Estimates of cost for Certain Proposals.

Name of the proposal	Expenditure (In lakhs of rupees).	
	Recurring	Non-recurring
(1) Double shift system at Calcutta Medical College	1.30	0.10
(2) (*a*) Improvement of existing medical colleges in India	115.50	432.00
(*b*) Improvement of existing medical colleges in Pakistan	16.50	115.50
(3) Provision of Departments of Preventive Medicine and Public Health in 3 medical colleges at Calcutta, Bombay and Madras	6.75	6.00
(4) Scholarship scheme for post-graduate training in India (50 scholars). — Scholarships.	0.60	...
— tution fees.	0.15	
— Travelling allowance at Rs. 150 each	0.075	
	0.085	

(5) Expansion of training courses at the All-India Institute of Hygiene and Public Health	2.66	2.80
(6) (a) Dental Interim Scheme for Calcutta	1.49	1.69
(b) Dental Interim Scheme for Bombay	1.49	1.69
(7) Nursing Colleges	1.50	1.00
(8) Lady Reading Health School	0.71	.....
(9) Expenditure for the training of certain types of non-medical health personnel in the provinces	2.05	0.11
(10) Scholarships for training in medical social work (12 each year; course 2½ years)		
One course of 2½ years—		
1st year—		
Scholarships	0.18	
Travelling allowance	0.018	
	0.198	
2nd year—		
Scholarships	0.36	
Travelling allowance	0.018	
	0.378	
First six months of 3rd year—		
Scholarships	0.54	
Travelling allowance	0.018	
	0·558	
(11) College of Pharmacy, Bengal	1.25	2.0
	153.159	562.89

ALL INDIA INSTITUTE OF HYGIENE AND PUBLIC HEALTH

Table A—Existing Courses

Name of the course	Duration of the course	Present maximum No. of admissions	Size of the class after enlargement if any
1. Diploma in Public Health and Hygiene	9 months	60	60
2. Diploma in Health and Hygiene	9 months		
3. Diploma in Maternity and Child Welfare	9 months	10	20
4. Doctor of Science (Public Health)	2 years	An occasional student	..
5. Certificate in Maternity and Child Welfare	3 months	10	20
6. Certificate in Industrial Hygiene	3 months	10	15
7. Certificate in Nutrition	3 months	10	15
8. Certificate in Laboratory Technique	6 months	30	30
9. Certificate in Biometric Technique	3 months	8	15

ALL INDIA INSTITUTE OF HYGIENE AND PUBLIC HEALTH

Table B—Proposed New Classes

Name of the Section	Name of the course	Duration of the course	No. of courses in the year	Maximum No. of admissions	Remarks
Sanitary Engineering Section.	(*a*) Course for water and sewage plant operators.	3 months	One	6	The course will consist of lectures and laboratory work in Calcutta for 2 months followed by an examination and regular work on plant control for a month at Calcutta, Jamshedpur or Delhi.
	(*b*) Course for officers in charge of training for health inspectors in the provinces.	2 months (Jan. and Feb.) each year.	One	3	To study the meths of assessing sanitary condition, rural health work etc,
	(*c*) M Sc. in Public Health Engineering.	14—20 months.	One	30	This training is meant for qualified engineers.
	(*d*) A short course in Sanitary Engineering.	3 months	One	10	This course is meant for overseers and sub-overseers.
Section of Bio-chemistry, Nutrition and Physiological Hygiene.	(a) A short course for Social workers.	3 months	One	30	This course is meant for health visitors, health inspectors. junior medical officers in charge of maternity and child welfare centres, labour welfare officers, persons in charge of canteens and communalfeeling in industrial centres, officers deputed by the Food and Agriculture departments, school teachers, etc.
	(b) Diploma Course in Nutrition.	1 year	One	8	This course is meant for medical graduates, particularly with D.P.H. qualification and those with M.A. in Chemistry or Physiology. Students will learn chemical analysis of foodstuffs, the technique of spectrophotometry, the use of photometers etc., the principles of diagnosis of sub-nutrition and malnutrition, etc.

Name of the Section	Name of the Course	Duration of the course	No. of courses in the year	Maximum No. of admissions	Remarks
					Candidates can after training be employed by the provinces as Nutrition Officers. This course is intended to replace, in due course, the existing 3 months course.
	(c) Dietitian's Course.	9 months	One	20	To be undertaken by the Nutrition Section of the institute jointly with the Medical College Hospital at Calcutta.
	(d) Post-graduate course in Industrial Hygiene.	6—8 months	One	20	The course is intended only for doctors.
	(e) A shorter course for medical and non-medical types of personnel.	3 months	One	20	The course is intended for medical officers already employed in 'Industry health visitors sanitary inspectors, welfare Officers etc.
Section of Statistics.	(a) Course in Public Health Statistics.	1—2 years.	..	8	Qualified science graduates with mathematics in degree course or medical men with good mathematical career to be admitted for the course. They will be qualified for the post of Statistician to the Health Departments of provincial Governments, Municipal Corporations etc.
	(b) Training for the proper collection of data in social surveys.	10 weeks	Two	24	Workers interested in economic diet, vital statistics and other surveys are expected to take the course.
Section of Microbiology.	(a) Clinical Pathology course.	1 year (on the London Post-graduate School Model).	One	6—10	Qualified doctors will be eligible for this course. After training a successful candidate should be able to run a Clinical laboratory independently.
Section of Epidemiology.	Special course in Epidemiology for urban and rural health officers.	9 months	One	6	This course is intended to improve the knowledge of the subject of health officers, who have already had a course of training during their D.P.H. training

CHAPTER V

Requirements of Technical and Scientific personnel for Industrial Development and their Training Programme

by J. N. Ray

In the Statement on Industrial Policy, the Government of India decided to participate in industrial progress by—

(i) making loans or by subscribing a share of the capital in industrial undertakings which are considered to be of importance to the country's development;

(ii) guaranteeing a minimum dividend on capital or undertaking to meet the revenue losses for a fixed number of years;

(iii) giving adequate financial support to research organisations set up by industrial associations representing organised industries;

(iv) promoting industrial investment corporation or similar institution for meeting the capital requirements of industries which will be started;

(v) assisting industrialists in the procurement of capital goods required by them.

2. Uptill now, no legislative sanction has been obtained for the objectives stated above. In view of the political uncertainties, it has not been possible to formulate any concrete plans on the above lines. Except in so far as the Fertiliser Project is concerned no progress has been made with regard to various industries which it has been thought necessary for Government to participate in. Several schemes such as the production of steel, penicillin, sulpha drugs, anti-malarials, etc., are under the consideration of the Government of India, but no definite decisions have been taken. It is, therefore, extremely difficult to state, at this stage, what would be the requirements of technical personnel for direct employment by Government. The various Development Directorates need only specialists and they are available except in certain industries such as Rubber, Plastics, Rayon, Glass, etc.

3. The Development programme followed by the Department has been entirely left to private initiative uptill now. By giving guidance and help, it was possible to interest Indian industry in expanding existing capacity and starting new lines of production. The profit motive was the only inducement. Rightly, or wrongly, since the last Budget Session, there has been considerable falling off of applications from industry to start new lines of manufacture. It is, therefore, not possible to foresee what would be the requirements of industry for technical personnel unless it is definitely known what would be the precise industrial policy of the Central Government.

In the Statement of Government of India's Industrial Policy referred to above, a striking omission has been the absence of any reference to the views of Government about the role of foreign capital in the industrial development of India and the conditions under which assistance of foreign capital will be sought in the promotion of that objective. Many applications have been received from foreign industrialists asking for permission to start industries in India on 50-50 partnership between Indian and outside capital. As far as is known to me, no definite decisions have yet been made in this connection by Government.

4. When these various issues have been clarified, it will be possible to gauge with a certain amount of exactitude the requirements of technical personnel during the next few years. The only way in which an assessment can be made of the immediate requirements is to analyse the new Capital Floatations allowed by Government and infer from that the increased requirements of technicians. The table below gives the position of new capital issued for various industries since January 1946. In the last column is shown the

number of additional technical personnel that would be required for the successful running of these industries. The technical personnel have been divided into three categories:—

'A'—Experts.
'B'—Technicians with superior qualifications.
'C'—Lower grade technicians including mechanics.

Industries.	New Capital floated in 1946 (in lakhs)	Estimated requirements (Grades).		
		'A'	'B'	'C'
1. Glass & Ceramics	213	10	30	200
2 Chemicals and Drugs	570	20	100	250
3. Soap and Oils (excluding edible Oils and Vanaspati).	110	8	10	100
4. Rayon and Art Silk	402	6	30	200
5. Paper, Board etc.	281	10	50	150
6. Plastics	50	10	40	200
7. Leather	85	5	13	35
8. Cement	463	10	20	80
9. Woollen	137	10	36	100
10. Rubber	117	7	94	188
11. Engineering	1,242	25	150	1,000
12. Electrical	910	25	150	300
13. Non-ferrous Metals	98	6	45	250
14. Machine Tools	122	100	400	1,000

5. It will be seen that new Capital floated in 1946 is 47 crores. In 1937 the capital invested in organised industry was estimated at 80 crores. It is therefore clear that in 1946 alone the capital issued in Industry increased by about 60 per cent., and in this, the increase of Capital for Textiles, Collieries and Food Industries has not been included.

6. 'A' Grade Technicians are experts and specialists in the subject and it would be difficult to obtain their training in India in most cases. The overseas Scholarships Scheme provides for the training of 'A' Grade Scientists. We have sent out Scholars as shown below:—

Subjects	No. of scholarships allotted. 1946-47	1947-48
(1) Chemical Engineering including Fertilisers	6	5
(2) Fuel Technology	2	...
(3) Glass Technology	1	2
(4) Industrial and applied chemistry including Tanning, Currying, and Leather Technology.	2	...
(5) Small Arms and Ammunitions :		
(a) Manufacture of High Explosives and Propellants	1	...
(b) Manufacture of small arms ammunitions	1	...
(6) Mechanical Engineering Power House Maintenance and Operation	2	5
(7) Wood Technology	3	2
(8) Electrical Engineering	...	4
(9) Fermantation Power Alcohol	...	1
(10) Metallurgy	...	3
(11) Rubber Technology	...	1
(12) Paints	...	3
(13) Paper Technology	...	1
(14) Plastics	...	3
(15) Statistical Economics	...	2
(16) Cellulose	...	1
	18	33

In thus selecting scholars, we have taken into consideration, the recommendation of the various Panels set up by the late P & D. Deptt.

7. We are, however, finding difficulties in placing these students for higher technical training abroad. We have, therefore, already drawn the attention of

Education Department to the fact that a certain number of these should be trained in India. We have suggested that a priority list of subjects should be drawn for this purpose. It should indicate those subjects in which training cannot be imparted in India and for which scholars should perforce be sent abroad. For other subjects, training should be arranged on a co-operative basis through the Inter University Board so that a scholar may, for some length of time, be attached to one University for specialising in a particular branch and on completion of training there, may be passed on to another. For example, the following subjects can be easily dealt with by the Indian Universities on a co-operative basis:

(1) Oils and Fats.
(2) Glass except very highly specialised aspect.
(3) Natural products.
(4) Textile Chemistry.
(5) Leather Technology.
(6) Refractories and Ceramics.
(7) Paint and Varnishes.
(8) Paper Technology.
(9) Synthetic Drugs, etc. etc.

After he has completed the university course, he should be placed for practical training with the industries here.

8. We understand that certain industries will accommodate a limited number of students provided they are not a financial burden on the firms giving the training. Reluctance on the part of firms to give practical training can be overcome by introducing suitable clauses in Govt. contracts or by other measures so that it becomes incumbent on them to train a certain number of students. It has also been brought to our notice that one of the principal difficulties in the way of firms taking up students for training is housing. We have been told that certain important firms like the Tatas may take an increasingly larger number of students, provided Government is prepared to build accommodation for them.

9. The present facilities for training 'B' Grade technicians are as follows:—

	Present output
Chemical Engineering and Technology	244
Civil and Municipal Engineering	467
Mechanical Engineering	258
Mining Engineering	27
Metallurgical Engineering	27

We have indicated our immediate requirements of 'B' Grade technicians for various industries. It will be noticed that except in Chemical Technology, specialist training is not imparted in most of the subjects. Our recommendation would, therefore, be that the existing technological departments be given immediate grants so that the ordinary M. Sc. graduates in Chemical Technology can be trained in special subjects for a short period to supplement their basic scientific training. We feel that the following institutes, if reinforced with capital grant and a certain additional recuring grant, would be able to provide a short term course to these technological graduates:—

	Capital grant (Lakhs.)	Recurring grant. (lakhs)
(1) Harcourt Butler Technological Institute, Cawnpore	5	1
(2) College of Technology, Hindu University, Benares	5	*2
(3) Department of Applied Chemistry, Calcutta University	7	*2

(4) Laxminarayan Tech. Institute, Nagpur	3	0·8
(5) University College, Andhra University	3	0·5
(6) Indian Institute of Science, Bangalore	..	*2
(7) Bengal Tanning Institute, Calcutta	1	0·5
(8) Institute of Leather Technology, Madras	1	0·5
(9) Engineering College, Guindy, Madras	2	0·75
(10) Department of Engineering and Technology, Annamalai University	1	0·5
(11) Department of Chemical Technology, Bombay University	1	0·5
(12) Forest Research Institute	2	0·7
(13) College of Engineering and Technology, Jadavpur	2	1·0
(14) Victoria Jubilee Technical Institute, Bombay	1	0·5

10. We have indicated against each institute what, in our opinion, would be required by way of capital grant and recurring expenses to fit them for these intensive post-graduate courses of short term duration. Each institute should select a group of subjects and a student trained in one aspect of the subject should supplement his training in one or more institutes. The whole course should not exceed 12 months in these institutes and should be followed by 6 months practical training. The recurring grant also envisages the recruitment from abroad of a few specialists by some of these institutes on a short term basis for training instructors. These are marked with a star mark.

11. The training in tanning and footwear has a special importance, as India is one of the largest producers of skins, hides and footwear. I am indebted to Mr. Randall for the following:—

'TANNERIES" —"There are only two institutions of importance in India, *viz.*—The Bengal Tanning Institute, Calcutta and the Institute of Leather Technology, Madras. The Bengal Tanning Institute has a degree course and also diploma course. The Madras Institute is believed to be initiating a degree course; hitherto they had only a diploma course. Both institutions should turn out potential grade technicians if students of a sufficiently high calibre take the degree course. In the past such students have been in the minority.

"It is estimated that these two Institutes pass out approximately 30 students annually and when the Degree Course is fully established, these would be composed of 10 of the degree class and 20 diploma class. The 10 may be classified as potential grade 'A' and 'B' technicians and the rest as grade 'C'. Other less important institutions such as the Jullunder and Bombay Institutes cater largely for the training of students interested in the cottage industry section of leather production.

'FOOTWEAR AND LEATHER INDUSTRIES':

"There are no instructions catering for the training of technicians for these two industries other than small institutions such as the Cawnpore Leather Working School. The training given is wholly for hand made production and produces men of the craftsman type rather than the technician.

"Although it is essential that facilities for technical training in these two industries should be provided, there are many difficulties in the way of immediate progress, *e.g.* non-availability of the necessary plant and trained instructors for teaching the use of such plant.

"The P. & D. Department Panel's recommendation concerning the Tanning, Footwear and Leather Goods Industries and the training of technologists was:—

(1) The existing Tanning Institutes should be made more efficient and useful by adding to their equipment and by their having better paid staff."

(2) The students of these Institutes before they get their final certificates or diplomas should be made to work in Industrial concerns. Central and Provincial Governments should arrange with industrial concerns provision of facilities for such training and apprenticeship.

"It is considered that the development and promotion of scientific and technical research would be best stimulated by:—

(1) Leather chemistry being accepted as one of the special subjects in the M.Sc. degree in Industrial Chemistry.

(2) Students who take leather technology as a special subject and obtain their M.Sc. degree may then carry on research work in leather chemistry with a view to obtaining their Doctorate."

12. The most difficult part of the scheme would be the training of grade 'C' technicians. The existing facilities in India are totally inadequate and unless these lower grade technicians are thoroughly trained, we fear that the industrial development of India will be considerably delayed. At present the institutions which can profitably undertake the training of technicians are limited in number. As far as we know, the following offer scope for training of 'C' grade technicians and with the strengthening of their resources as indicated will be able to achieve a great deal:—

	Capital Grant (lakh)	Recurring Grant (lakh)
(1) Technological College, Dayalbagh	1·5	0·75
(2) Government Technical Institute, Lucknow	1·5	0·75
(3) Delhi Polytechnic, Delhi	—	—
(4) Engineering College, Anantpur	1·5	0·75
(5) College of Engineering, Cocanada	1·5	0·75
(6) College of Engineering, Bangalore	1·5	0·75
(7) Sri Jayachamarajendra Occupational Institute, Bangalore	1·5	0·76
(8) College of Engineering and Technology, Jadavpur	1·5	0·75
(9) Bengal Textile Institute, Serampore	1·5	0·75
(10) Victoria Jubilee Technical Institute, Bombay	1·5	0·75
(11) Railway Workshops	—	—
(12) Ordnance Factories	—	—

13. We have not been able to assess accurately the cost involved, but we feel that it will be necessary to train at least 1,000 to 2,000 'C' grade technicians, in the immediate future. We feel that a system of scholarships should also be instituted to make it possible for 'C' Grade technicians already engaged in industry to take a short special course. This should be arranged in cooperation with the Railway Workshops, Ordnance Factories and the various Engineering firms. In our opinion, a sum of 5 lakhs of rupees should be immediately earmarked for giving scholarships and maintenance allowances of lower grade persons engaged in industry.

14. The total number of students that can be trained under the above scheme can be calculated according to the formula laid down by Education Department. We will effect a considerable amount of saving on account of scholars that we would have otherwise sent abroad.

15. The firms in the attached list would with a proper understanding arrived at between them and the Government offer suitable opportunities for practical training to both 'B' and 'C' grade technicians.

PAY AND STATUS OF THE TECHNICIAN

16. The status of the technician in Industry today is rather unsatisfactory. It is suggested that there should be a basic uniformity in the grades of pay of

technicians over the entire range of organised industry. This applies particularly to 'C' grade technicians.

17. At present, the technician suffers from an inferior position in relation to the executive branch of business organisations. Unless this is remedied, the inflow of technician will be hampered.

18. So far as technicians in Govt. service are concerned, it has been stated that their status requires to be raised. We are not worried about the position of technicians and scientists in Government employ, as we are sure that in future their status would largely be determined by the goods they can deliver. Mere allocation of status to a scientific man would not ensure that he would be able to exercise authority. He should have the requisite knowledge and ability.

19. The question of an All India Scientific Service has been raised. We are in full agreement with the view that an All India Scientific Service should be instituted so that the inequalities existing in different spheres of employment might disappear. Also, we agree that it is desirable to eliminate isolationist tendencies to which scientists in Government employment have become subject; but we feel that the solution suggested, namely, that scientists amongst universities, Provincial Governments and Industry should be periodically interchangeable is hardly practicable. There would be innumerable administrative difficulties which it would be hard to overcome.

Conclusion.

20. To summarise, my recommendation would be:—

(1) To appoint an expert Committee to examine what subjects can be taught in India and arrange for their teaching in co-operation with Universities and technical Institutions for training 'A' Grade Technicians.

(2) To institute a course of intensive short training for 'B' Grade technicians on a co-operative basis by Universities and Industrial Concerns. The cost of such a Scheme would be 34 lakhs in Capital Grant and 13·25 lakhs in Recurring Grants.

(3) To arrange for the training of 'C' Grade Technicians at a cost of 13·5 lakhs in Capital Grant and 6·75 lakhs in Recurring Grants.

(4) To earmark Rs. 5 lakhs per annum for refresher and supplementary courses for technicians engaged in Industry.

(5) To earmark a certain sum for providing housing and other necessities at Selected Factories for training 'B' and 'C' grade technicians.

(6) To enact legislative measures for enforcing a factory to take a certain number of students every year for factory training.

J. N. RAY.

LIST OF FIRMS, WHICH CAN OFFER SUITABLE OPPORTUNITIES FOR PRACTICAL TRAINING TO BOTH 'B' & 'C' GRADE TECHNICIANS

Chemicals and Drugs

1. M/s. Bengal Chemical and Pharmaceutical Works, Calcutta.
2. M/s. Tata Chemicals, Bombay.
3. M/s. D. C. M. Chemical Works, Delhi.
4. M/s. Shambhunath Acid Factory, Amritsar.
5. M/s. Dharamsi Mularji Chemical Company, Bombay.
6. M/s. Mysore Chemicals and Fertilisers, Mysore.
7. M/s. Eastern Chemical Co., Bombay.
8. M/s. CIPLA, Bombay.
9. M/s. Zandu Pharmaceutical Works, Bombay.
10. M/s. Mettur Chemicals, Mettur Dam.
11. M/s. Alembic Chemical Works, Baroda.
12. M/s. Bengal Immunity Co., Calcutta.
13. M/s. Standard Pharmaceutical Works, Calcutta.
14. M/s. Bathgate and Company, Calcutta.
15. M/s. Smith Stanistreet and Company, Calcutta.
16. M/s. Cawnpore Chemical Works, Cawnpore.

Leather Industry

17. M/s. Cooper Allen and Company, Cawnpore.
18. M/s. The Cawnpore Tannery Ltd., Cawnpore.
19. M/s. The Eastern Tanneries Ltd., Cawnpore.
20. M/s. The Indian National Tannery, Cawnpore.
21. M/s. The Hindusthan Tanneries Ltd., Cawnpore.
22. M/s. The Chrome Leather Company, Ltd., Cawnpore.
23. M/s. The Gordon Woodroffe Leather Mfg. Co., Madras.
24. M/s. The Mysore Chrome Tanning Co., Bangalore.
25. M/s. The National Tannery Company Ltd., Calcutta.
26. M/s. The Calcutta Tanneries Ltd., Calcutta.
27. M/s. The Bata Shoe Co., Ltd., Batanagar.
28. M/s. The Western India Tanneries Ltd., Bombay.

Paints and Varnishes

29. M/s. Shalimar Paint Colour and Varnish Co., Ltd., Calcutta.
30. M/s. Jenson and Nicholson (India), Ltd., Calcutta.
31. M/s. Napier Paint Works, Calcutta.
32. M/s. Murarka Paint and Varnish Works, Calcutta.
33. M/s. Hadfields (India) Ltd., Calcutta.
34. M/s. Hoyle Robson & Barnett and Company, Calcutta.
35. M/s. Macfarlane and Co., Ltd., Calcutta.
36. M/s. Calcutta Paint Colour and Varnish Works, Calcutta.
37. M/s. Solar Paint and Varnish Mfg. Co., Calcutta.
38. M/s. P. C. Chanda and Company, Calcutta.
39. M/s. Goodlass Wall (India), Ltd., Bombay.
40. M/s. Elephant Oil Mills, Ltd., Bombay.
41. M/s. Cooper and Company; Bombay.
42. M/s. Hardcastle Waud and Company, Bombay.
43. M/s. Jyoti Paint and Varnish Industries, Madras.
44. M/s. D. Waldie and Company, Ltd., Calcutta.

Paper

45. M/s. Titaghur Paper Mills, Titaghur.
46. M/s. Bengal Paper Mills, Calcutta.
47. M/s. Shree Gopal Paper Mills, Abdullapur.
48. M/s. Orient Paper Mills, Calcutta.
49. M/s. Rohtas Industries, Dalmianagar.

50. M/s. Jaswant Straw Board Mills, Meerut.
51. M/s. Straw Board Mfg. Co., Saharanpur.

NON-FERROUS.

52. M/s. The Indian Copper Corporation Ltd., Ghatsila. P.O. B.N. Rly.
53. M/s. Star Metal Refinery, Bombay.
54. M/s. Aluminium Corporation of India, Ltd., Cawnpore.
55. M/s. Indian Aluminium Company, Alwaye.
56. M/s. Biani Metal Works, Ltd., Calcutta.
57. M/s. Kamani Metal Refinery and Metal Industries, Bombay & Jaipur.
58. M/s. Bengal Ingot Co. Ltd., Calcutta.
59. M/s. The National Rolling Mills, Calcutta.
60. M/s. The India Rolling Mills, Ltd., Calcutta.
61. M/s. Venesta Ltd., Calcutta.
62. M/s. The Shapraria Iron and Steel Works, Bombay.

MACHINE TOOLS.

63. M/s. Jessop and Company, Calcutta.
64. M/s. Cooper Engineering Works, Satara.
65. M/s. Indian Machinery Ltd., Howrah.
66. M/s. Mysore Kirloskar Ltd., Mysore.
67. M/s. Brittania Engineering Co. Ltd., Tittaghur.
68. M/s. Maya Engineering Works, Calcutta.
69. M/s. Investa Machine Tools and Engineering Co. Ltd., Bombay.
70. M/s. Richardson and Cruddas Ltd., Bombay.

MECHANICAL ENGINEERING.

71. M/s. Kirloskar Bros., Kirloskarwadi.
72. M/s. P. S. G. & Sons, Coimbatore.
73. M/s. Bahri Engineering Company, Jamshedpur.
74. M/s. Jay Engineering Works, Calcutta.
75. M/s. Cooper Engineering Works, Satara.
76. M/s. India Machinery Ltd., Dum Dum, Calcutta.

ELECTRICAL INDUSTRIES.

77. M/s. Clyde Fan Co., Calcutta.
78. M/s. Kaycee Industries, Calcutta.
79. M/s. India Electric Works, Ltd., Calcutta.
80. M/s. Calcutta Electrical Mfg. Co., Calcutta.
81. M/s. Model Industries, Dayalbagh.
82. M/s. British India Electric Construction Co., Calcutta.
83. M/s. Everest Engineering Company, Calcutta.
84. M/s. Greaves Cotton and Crompton Parkinson, Bombay.
85. M/s. Bengal Electric Lamp Works, Calcutta.
86. M/s. Electric Lamp Manufacturers of India, Ltd., Calcutta
87. M/s. Mysore Lamp Works, Ltd., Bangalore.
88. M/s. Lux Lamps Ltd., Calcutta.
89. M/s. Associated Electrical Industries (India), Ltd., Calcutta.
90. M/s. Phillips Electrical Co. (India), Ltd., Calcutta.
91. M/s. General Electric Co. (India), Ltd., Calcutta.
92. M/s. F. & C. Osler Ltd., Calcutta
93. M/s. Siemens (India), Ltd., Calcutta.

POTTERIES.

94. M/s. Bengal Potteries, Calcutta.
95. M/s. Gwalior Potteries, Gwalior and New Delhi.
96. M/s. Parashuram Potteries, Thangadh.
97. M/s. Sodepore Potteries, Sukchar.

98. M/s. Bengal Porcelain Company, Calcutta.
99. M/s. Burn and Company, Calcutta.
100. Government Porcelain Factory, Bangalore.
101. M/s. Parry and Company, Madras.

GLASS.

102. M/s. Scientific Indian Glass Company, Ltd., Calcutta.
103. M/s. U. P. Glass Works, Ltd., Bahjoi.
104. M/s. Seraikella Glass Works, Kandra.
105. M/s. Allahabad Glass Works, Naini.
106 M/s. Capital Glass Works, Melaknagar.
107. M/s. Ganga Glass Works, Ltd., Balawali.
108. M/s. Kaycee Glass Works, Shikohabad.
109. M/s. Khandelwal Glass Works, Sasni.
110. M/s. New India Glass Works, Calcutta.
111. M/s. Ogale Glass Works, Ogalewadi.
112. M/s. Paisa Fund Glass Works, Talegaon.
113. M/s. Vibhuti Glass Works, Benares.
114. M/s. Sodepur Glass Works, Calcutta.
115. M/s. Jain Glass Works,

REFRACTORIES.

116. M/s. Burn and Company, Calcutta.
117. M/s. Reliance Firebrick and Pottery Co. Ltd., Calcutta.
118. M/s. Behar Firebricks and Potteries Ltd., Calcutta.

SOAP AND OILS

119. M/s. Lever Bros., Bombay.
120. M/s. Tata Oil Mills, Bombay.
121. M/s. Godrej Soaps, Bombay.
122. M/s. Swastik Oil Mills, Bombay.
123. M/s. Mysore Govt. Soap Factory.
124. M/s. The Kerala Soap Factory, Calicut.
125. M/s. Bengal Chemical and Pharmaceutical Works, Ltd., Calcutta.
126. M/s. Jadavpore Soap Works, Calcutta.
127. M/s. Modi Soap Works, Meerut,
128. M/s. Techno Chemical Industries, Calicut.

RUBBER

129. M/s. Dunlop Rubber Company, Calcutta.
130. M/s. Firestone Tyre and Rubber Company, Bombay.
131. M/s. Bata Shoe Company, Batanagar.
132. M/s. Bengal Waterproof Company, Calcutta.
133 M/s. A. K. Sarkar Company, Calcutta.
134. M/s. Travancore Rubber Works, Trivandrum.
135. M/s. Indian Rubber Manufacturers, Calcutta.

WOOLLEN

136. M/s. Cawnpore Woollen Mills. Cawnpore.
137. M/s. Raymond Woollen Mills, Bombay.
138. M/s. Indian Woollen Mills, Ltd., Bombay.
139. M/s. Bangalore Woollen Mills, Ltd., Bangalore City.
140. M/s. Shri Dinesh Mills, Ltd., Baroda.
141. M/s. Raj Spinning Mills, Amritsar.
142. M/s. Oriental Carpet Manufacturers (India), Ltd., Amritsar.
143. M/s. B. K. Subbayah and Sons, Bangalore City.
145. M/s. Nagpal Woollen Mills, Bombay.

146. M/s. Associated Cement Companies Ltd., Bombay.
147. M/s. Dalmia Cement Limited, Dalmianagar.
148. M/s. Assam Bengal Cement Co. Ltd., Calcutta
149. M/s. Andhra Cement Co. Ltd., Bezwada.

CHAPTER VI

R.I.A.F. Training, Research and Development in Collaboration with Civil Institutions

By

H. SINGH

OBJECT OF MEMORANDUM

To explore possibilities of training, research and development for R.I.A.F. in collaboration with civil Institutions and research bodies.

1. *Technical training and expansion in collaboration with civil aviation.*

Training.—It is strongly recommended that the present Technical Training Scheme of Government of India, Civil Aviation be co-related to the Training Scheme of R.I.A.F. in as far as common trades are concerned. This closer fusion can provide many advantages as:—

(i) Pace of training can be quickened.

(ii) Uniform standard of training can be attained.

(iii) Facilities can be available by which Air Force Personnel in peace time could be provided to Civil Aviation and the Civil Aviation Technicians could be switched on to Air Force should a national emergency arise. A pool of trained personnel can meet the requirements of both the organisations at any time.

Trade Testing.—The Ground Engineers with A,B,C,D, & X licenses and tradesmen in Civil Aviation can be usefully employed by Air Force but in such it is essential that Air Force is fully represented on the examining bodies and if suitable for Air Force their certificates endorsed "Acceptable to Defence Services".

A detailed scheme in this connection can further be discussed by which the common trades of Civil Aviation and Air Force as well as the basic and specialist courses of common design could be worked out to uniform standard. The Civil Aviation Training Centre at Saharanpur could be utilized for such purpose.

2. *Development and Research.*—Defence Services appreciably rely on the works done by Scientists who also work to the requirements of Forces. Up to now R.I.A.F. has been a prominent part of R.A.F. in the U.K. Air Ministry holds the functional control of both the R.A.F. and the Civil Aviation. In all the researches and developments in Aircraft, Air Ministry is the supreme authority. R.A.F. is fully represented in Air Ministry. In this way R.I.A.F. has been dependent on the authority of Air Ministry. It is now strongly emphasised that similar link befween R. I. A. F. and Civil Aviation be formed which would actively keep liaison with Civil Institutions and eminent works in the advancement and researches of Indian Development on Aircraft side. Further possibilities should be explored for the following Institutions:—

(i) Hindustan Aircraft Factory, Bangalore.

(ii) Institute of Science (Aeronautical Engg.), Bangalore.

(iii) Engineering University, Roorkee, Aeronautic 1 Engg. Group.

(iv) Forest Research Institute, Dehra Dun.

(v) Supdt., Instrument and Optical Factory, Dehra Dun.

(vi) Ordnance Laboratories, Cawnpore.

There are number of resources which have been untouched and could be remarkably utilized in the interest of aircraft development for Civil and Air Force purpose. Indian Timber opened a great subject during the War for Aeronautical Manufacture but no efforts were further made to utilize the work for Airframes and Propellors. Greatest steps are now required to have a team of Civil and Air Force Engineers organised to take up this work in hand.

Radio Training and Research.—Wireless applied to aviation has become an instrument of very high importance. It has proved beyond doubt that the **safety of Aircraft in Air, in Operations, or in Flight is highly dependent on Wireless appliances connected to flying.**

In passive Air Defence against Enemy Aircraft, Wireless has played a part of decisive nature.

The training provided by Indian Universities in physical science and post-graduate study in physics hardly gives a turn out of young men who would normally be utilized beyond that of maintenance standard of wireless appliances. India has not been able to make advancement in Radio Communication owing to the lack of facilities of research in this subject. Joint representations should be made to provide development facilities to the interest of Civil Aviation and Air Force with important institutions such as:—

(i) Institute of Science Bangalore.

(ii) Govt. Radio Factory, Bangalore.

(iii) Victoria Jubilee Technical Institution, Bombay.

and any other such institutions which could be agreed upon to be of help in setting up the development machinery. The institutions should be actively collaborated in the achievement of peace-time and operational necessities of Wireless. Continuous references for service and civil training in these lines should be made to these institutions.

Airborne Armaments and Explosives.—No facilities are available in this country by which the specialist armament and explosives for Aircraft could be taken up for manufacture. Indian Air Force has been predominantly dependent on the supply and directions of Air Ministry. A high field of work lies untouched whereby the work on armament and ammunitions should be carried on for reserve storage and experimental basis. In this connection the Command Armament should be reorganised on a higher status. Closer liaison should be set up with Army Ordnance and further possibilities should be explored for taking advantage of Ordnance and Explosive Factories now in existence in Command. Ample encouragement should be given for appointing desirable chemists, physists and engineers to do research work directly in contact with the Ordnance Factories and who on their part will pass their higher problems for special investigations, with civil research institutions.

General.—For such achievements it would be desirable to set up Armed Explosives, Scientific Aircraft Experimental Stations which would pass their work to Air Council. It is worth mentioning on this issue that Air Council will be the supreme body for maintaining foreign liaison, collecting command requirements, collecting and controlling experimental stations and final approval of the works through Command Armament.

CHAPTER VII

Programme for provision of facilities for education, training and research in GEOLOGY and MINING which can be initiated within the next six months

By

D. N. WADIA

Facilities for advanced geology education and research, unlike those for the physical and biological sciences, were, until very lately, practically non-existent in Indian Universities. That was largely because, prior to war, there was hardly a demand for five geologists a year and not more than double that number of mining men, all for subordinate positions in industry, teaching line, and very rarely in Government employ.

2. Within the last 7 or 8 years, there has sprung up a sudden increase in this demand—over 400 to 500 per cent—and the few existing geological training institutions, namely some five universities and the Indian School of Mines, have been hard put to it to meet this sudden increase in intake. Up to 1940, there were only four universities which had geology departments, equipped for teaching up to B.Sc. (Hons.) or M.Sc. standard, but which possessed insufficient means for giving practical field geological training. Since 1940, four more universities (Andhra, Lucknow, Patna and Nagpur) have instituted geological faculties, though these are also not in a better position than the older universities for providing adequate facilities for post-graduate research as well as an efficient system of practical field training.

3. The education of working geologist is different from that of other scientists and demands not only class-room and laboratory teaching, as in the other sciences, but also a system of field training and instruction in the open country, requiring prolonged camping seasons in distant geological provinces and mining areas—a type of instruction which is rather costly and out of the common and few of our colleges and universities were, and even yet are, in a position to provide efficiently. The Geological Survey of India is the only agency that can help the educational institutions in this post-collegiate training in the field to supplement the purely academic education of the class-room. The limited facilities at the command of the Geological Survey, however, for this purpose have been fully taxed in training their own recruits which have of late largely multiplied.

4. It is from this background that the question of man-power in Geology has to be viewed. The pre-war set-up being so unsatisfactory for providing to the country the right type of geologists, Government directed its attention in 1944 to improve the situation. In 1945, two committees were formed—the Geology Education Committee and the Indian School of Mines Re-organisation Committee—with the object of improving Geology and Mining education and increasing the out-put of properly trained personnel. These two committees have completed their work and submitted their reports, recommending measures for securing the desired results within the coming five years. The recommendations of the Geology Education Committee for help to geology departments of universities, *viz* financial grants, procuring of laboratory apparatus, camp equipment and in the training abroad of one member of the tutorial staff, side by side with suggestions for management and strength of classes, limit of number of students and length of different courses, are likely to result in increase in the number of graduates and pots-graduates in Geology, to a level more or less in keeping with the demand, and also improve the quality of the turn out. The Indian School of Mines, after the suggested re-organisation of its staff, buildings, laboratory extensions and revised courses of underground training, will turn out double the number of qualified mining engineering graduates, which it is doing at present (a target figure of 48 per year plus

12 Applied Geology students). The standard of training and practical instruction imparted to these mining men will compare favourably with that of foreign mining schools, both as regards theory and the practical side of mining.

5. Since the present sub-committee is called upon to frame a programme for provision of facilities for education, training and research in Geology and Mining which can be initiated within the next six months, it cannot do better than ask for a speedy implementation of the two reports that have lately been presented to Government—(1) by the Geology Education Committee in October 1946, and (2) by the Indian School of Mines Reorganisation Committee in June 1947. Both these reports have suggested procedure and programme of requirements and recommended facilities to be provided for improving the quality and quantity of trained geological and mining personnel that will be required soon for manning the expanded Geological Survey of India, the various mineral industrial development projects and mining and metal industry of the country.

6. The effect of these measures, if quickly implemented will be to produce, on an average, about 64 qualified mining and metallurgy graduates per year (48 from Dhanbad School of Mines plus 16 from Benares Hindu University) after 1950, and between 70 and 80 Geology graduates annually of M.Sc. and B.Sc. (Hon.) standard (60—70 from the universities plus 12 from Dhanbad School of Mines). The quality and grade of instruction provided in the revised schemes at these institutions, however, though considerably improved, will not be such that the trainees can go into direct employment without at least six months of field experience and training in methods of geological survey and mapping. For this, extra provision is necessary and the present Scientific Man-power Committee should make recommendations to Government to this effect.

This field course constitutes the most difficult part in the training of geologists, but it is quite necessary and must be imparted, either during their final year of study, or immediately after their passing out. The only satisfactory way of imparting this practical training, under present-day conditions prevailing in India, is to assign the freshly passed graduates to the various field parties of the Geological Survey, for at least one full field season. Parties of 3 to 5 men may thus be assigned to 10 working field parties every year. Similarly a small number of students, during the latter part of their course, may be assigned to the vacation Mining Camps of the Indian School of Mines, Dhanbad, for securing practical experience of underground mining methods. The cadre of Geologists in the Geological Survey of India when it is complete by the addition of 14 new recruits this year, will be able to spare fairly senior officers, who can superintend this work of giving to fresh university graduates the necessary field training and practice in geological mapping, survey methods, etc.

7. I would, however, impress upon the sub-committee that the combined demand of India for Geology and Mining men will always be within rather narrow limits. I do not anticipate that, with all the new development projects in active operation, the total demand, within the next five years, will exceed 400 fully qualified geologists and mining engineers. Once the target of 150 geologists to be recruited for the Geological Survey of India within the next few years, is completed and the requirements of educational institutions expanding under Government grants scheme are satisfied, it is probable that the increased out-turn of geology M.Sc's. and post-graduate research men, and mining engineering men from the Indian School of Mines as well as from the improved mining faculty of the Benares Hindu University, may more than saturate the field of employment in these subjects, unless India

mining industry take a phenomental turn. We should, therefore, be careful to see that an over-multiplication of highly specialised men in these two subjects is not produced. The present programme may, therefore, be considered adequate to meet the demands of the next five years, at the end of which a fresh stock of the situation may be taken.

8. In the above paragraphs, consideration is given only to the requirements of higher ranks of professional geologists and mining men. But, in a modern State, Civil Engineering, Agriculture, Soil Science, Irrigation and Underground Water Supply need knowledge of geology as an essential subsidiary, and provision for imparting this elementary geological instruction has to be made. The revised B.Sc. Geological courses of our Universities and Colleges (which will now number about 12) and the Geology courses usually given in the Engineering and Agricultural Colleges will ordinarily meet the demand for this type of instruction, both as regards theory and the practical side. Civil Engineering and Agricultural Colleges are being modernised and re-equipped and Government is giving special grant to such institutions as the Jadavpur Engineering College, this will doubtless improve the facility for geology teaching in the non-specialist institutions.

CHAPTER VIII

Programme for the Improvement and Development of Higher Technical Education

By

S. R. SEN GUPTA

The inadequacy of the existing facilities for higher technical education in India is admitted on all hands. The Sarker Committee appointed by the Government of India to consider the development of higher technical institutions in India was of the opinion that both in quality and quantity the present facilities fell short of India's needs to produce high grade engineers and technologists. This Committee recommended the early establishment of four Regional Higher Technical Institutions on the lines of the Massachusetts Institute of Technology, each of them to provide a wide range of facilities for post-graduate study and research in addition to producing annually about 380 graduates in engineering and technology.

2. The Committee's recommendations were endorsed by the All-India Council for Technical Education, which were established on the 30th November, 1945, to survey the needs of the country as a whole for higher technical education and to advise the Government of India on all matters concerning higher technical education. This Council were of the opinion that in order to upgrade the existing institutions of engineering and technology it was most urgent that generous grants should be given by the Governments, Central and Provincial.

3. In the light of the above and other recommendations of the Council the Government of India have decided to initiate and implement the following development schemes within the quinquennium commencing from the year 1946-47:—

(i) Establishment of Regional Committees of the All-India Council for Technical Education to ensure the co-ordinated development of technical education and generally to raise its standard.

(ii) Improvement and expansion of existing non-governmental institutions of Engineering and Technology by giving them financial assistance.

(iii) Procurement of scientific and technical equipment for distribution free of charge or at nominal price, to deserving scientific and technical institutions including research institutions.

(iv) Development of the Delhi Polytechnic.

(v) Development of the Indian Institute of Science, Bangalore.

(vi) Establishment of the Eastern and the Western Higher Technical Institutions.

(vii) Establishment of a Central Training College for teachers in Technology.

(viii) Establishment of a Central School of Indian Architection and Town and Regional Planning.

(ix) Establishment of an Administrative Staff College for administrators engaged in industry, commerce and in Government employ.

4. **Establishment of Regional Committees of the All-India Council for Technical Education.**

Financial implication:—

Capital—Nil.

Annual Recurring—*Rs.* 1,84,000.

In order to enable the Council to tender judicious advice to the Government for the provision of facilities for technical education in every part of the country adequate in relation to the possible industrial development of

each region, the Council have decided to establish regional committees in co-operation with the provincial and state Governments, the latter have now under consideration definite proposals as formulated by the Council in regard to the demarcation of the regions as well as the composition and functions of such committees. The Government of India have sanctioned a nucleus staff for the proposed Regional Committees and there is every reason to hope that these committees will commence their work within six months.

Budget Provision.

1947-48—*Rs.* 20,00,000

5. Improvement and expansion of existing non-governmental institutions of Engineering and Technology.

The All-India Council for Technical Education are of the opinion that simultaneously with the establishment of high grade institutions of engineering and technology, the Government of India should give generous grants for upgrading and expanding some of the existing institutions of engineering and technology. A nominal provision of Rs. 20 lakhs has been made in the budget for the year 1947-48 without prejudice to expenditure sanction for implementing sound recommendations that may be made by the Council in this behalf. The Council consider that the following institutions require to be improved and developed:—

(i) College of Engineering and Technology, Jadavpur.

(ii) Department of Applied Chemistry, University College of Science and Technology, Calcutta.

(iii) Department of Applied Physics, University College of Science and Technology, Calcutta.

(iv) Engineering College, Benares Hindu University.

(v) College of Mining and Metallurgy, Benares Hindu University.

(vi) College of Technology, Benares Hindu University.

(vii) Engineering College, Davalbagh.

(viii) Engineering College, Aligarh Muslim University.

(ix) N.E.D. Engineering College. Karachi.

(x) Victoria Jubilee Technical Institute, Bombay.

(xi) Department of Chemical Technology, Forman Christian College, Lahore.

(xii) Department of Chemical Technology, Bombay University.

(xiii) Luxmi Narayan Institute of Technology, Nagpur University.

(xiv) Department of Technology, Andhra University.

(xv) Department of Chemical Technology, Madras University.

(xvi) Engineering College, Annamalai University.

The Council have appointed expert committees to visit these institutions and to make recommendations for their improvement and development. The expert committees for (i), (iv), (v), (vi), (vii), (viii), (xi), (xii) and (xv) have already submitted their reports and the committees for the remaining institutions are expected to submit their reports within a fortnight or so. A scrutinising committee of the Council is expected to examine all these reports and to submit its recommendations to the Co-ordinating (the Executive) Committee of the Council by the 31st August, 1947, which has been authorised by the Council to submit on their behalf the final recommendations to the Government of India early in September, 1947. If adequate funds are made available, it should be possible to initiate steps for the improvement of the

above institutions in October, 1947. This should raise their existing standard of education and in some cases also increase their training capacity, leading to a gradual increase in the annual output of graduates from them. The tabulated statement in Annexure shows the present as well as the additional anticipated output from each of these institutions when the development plans are implemented with financial assistance from the Government of India.

6. **Procurement of Scientific and Technical Equipment.**

(*A Fund of one crore of rupees*).

A considerable amount of stores and equipment of educational value was rendered surplus on the cessation of hostilities. These are being disposed of by the Government of India. A small organisation was set up in the Education Department for securing some of them for educational institutions. It was soon discovered, however, that if educational institutions, all of whom had been unable to secure any equipment since 1939, were to secure even their minimum requirements from this surplus stock, it would be necessary to provide them also with funds to purchase these. For, owing to the abnormal rise in prices, the institutions were able barely to meet their day-to-day expenditure out of the funds at their disposal.

Further, it was found that if materials of educational value were not to pass into the hands of dealers as a consequence of the disposals policy of the Government, it would be necessary for a Central Organisation to purchase and hold the required stock. The Government of India were accordingly requested about nine months back to provide a fund of one crore of rupees. But unfortunately Government decision in the matter has not been obtained as yet with the result that substantial quantities of valuable materials have already found their way into the hands of private dealers. If funds are made immediately available, even now it may not be too late to secure a substantial quantity of the materials for educational purposes.

It should not be overlooked that most of the institutions are ill equipped while much of their existing equipment is now old and require thorough overhauling. With a view to assisting the institutions to bring their equipment up-to-date, model inventories of minimum equipment required in an engineering college have been prepared and circulated to all engineering colleges, universities and Provincial Governments.

The Government of India can also help to improve the situation indirectly in other ways by instructing the Supply Missions to attach the highest priority to secure from abroad scientific and technical equipment and by removing all restrictions on the import of these articles.

7. **Development of the Delhi Polytechnic.**

Financial implications:—

Capital—Rs. 79,70,000.

Annual Recurring—Rs. 5,70,000.

Owing to the war-time difficulties, the Delhi Polytechnic which was started in 1941 could not be developed to its full stature. It is a unique institution of its kind in India in as much as it provides instructional facilities both full-time and part-time in a wide range of subjects such as Engineering, Applied Science, Textile Technology, Commerce, Art, Architecture, etc.

The inadequacy of teaching accommodation and the acute shortage of teaching staff are now hindering its proper development. While the first of these obstacles will be removed when funds asked for are made available, it is feared that unless the Government of India sanction more liberal salaries for teachers than at present, it would be well nigh impossible to develop the institution properly.

With the small extension of buildings that has now been taken in hand it should be possible to increase within the next six months the annual intake by the margin shown below, provided the terms and conditions of service of teachers are made sufficiently attractive:

(i) Architecture	30	Full-time
(ii) Arts & Crafts	15	Full-time
(iii) Radio Servicing	10	Part-time
(iv) Cooperative Course in Textile Technology	10	Part-time

8. **Development of the Indian Institute of Science, Bangalore.**

Financial implications:—

Capital—Rs. 1,03,000.

Annual Recurring—Rs. 7,94,000.

A four-year plan for the development of the Indian Institute of Science is now in the second year of its operation. Two new departments namely, Departments of Metallurgy and Internal Combustion Engines have been established and some of the existing departments improved. A High-Voltage Laboratory for research and a department of Power Engineering for the post-graduate training of power development engineers (civil, mechanical, electrical) are being established and should be ready to admit scholars from July, 1946.

In Annexure II will be found a statement showing the number of students admitted to different courses in the Institute in the year 1945-46. From this year, it may be possible to increase the annual intake as follows:—

(i) Physics (Research)—3.

(ii) Biochemistry (Research)—5.

(iii) Pure and Applied Chemistry and Chemical Engineering (Teaching and Research)—30.

(iv) Electrical Technology (Teaching and Research)—20.

(v) Aeronautical Engineering (Teaching and Research)—5.

(vi) Metallurgy (Teaching and Research)—12.

(vii) Internal Combustion Engineering (Teaching and Research)—10.

9. **Establishment of the Eastern and the Western Higher Technical Institutions.**

Financial implications:—

Eastern Higher Technical Institution.

Capital—Rs. 3,04,95,000.

Annual Recurring—Rs. 44,61,000.

Western Higher Technical Institution.

Capital—Rs. 3,50,00,000.

Annual Recurring—Rs. 44,00,000.

From the experiences gained during the recent war years, the Government of India came to the conclusion that for meeting India's post-war needs it would be necessary to augment and improve considerably the present facilities for technical education and decided to—

(a) introduce the overseas scholarship scheme for advanced education and training abroad of Indian graduates in engineering and technology.

(b) set up a committee under Mr. N. R. Sarker to recommend steps for the development of higher technological institutions for post-graduate study and research.

In February, 1946, the Sarker Committee submitted its report urging upon the Government of India the necessity of establishing with the least possible delay at least four Regional Institutions on the lines of the Massachusetts Institute of Technology, so that India's post-war needs might be met adequately.

The Government of India have decided to establish within the quinquennium commencing from the year 1946-47 two of these regional institutions namely, the Eastern and the Western Institutions, each for about 2,000 undergraduates and 1,000 post-graduates and research students. Each of these institutions is to have wide facilities for post-graduate study and research. For example, the Eastern Institution is expected to provide facilities for post-graduate study and research in the following subjects:—

Fuel Technology.

Pharmaceutics and Fine Chemicals.

Regional Planning.

Paper Technology.

Glass and Ceramics.

Plastics.

Paints and Pigments.

Hydraulic and River Research.

Transportation (including Railway Engineering).

Structural Engineering (including High Dams).

Design of Electrical Machinery.

Refrigeration and Air conditioning.

Automobile Engineering.

Machine-Tools.

Design of Machinery and Instruments.

Light Alloys.

Industrial Physics.

Electronics (including Radio Engineering).

Economics, Botany.

Geophysics, Geology, Mineralogy.

Meteorology.

Food Technology.

A number of sites for the proposed Eastern and the Western Higher Technical Institutions have been examined and the Government are expected to complete the purchase of two suitable sites within the next two or three months. The requisitions for the recruitment of the necessary planning staff are expected to reach the Federal Public Service Commission early next month. It has also been decided to send in autumn this year a small delegation to Europe and America to recruit such of the staff for certain key posts as are not likely to be available in India. It is hoped that it would be possible to fill up at least some of the key posts within the next six months. The planning of the college buildings and laboratories, the placing of order for equipment, and helping in the recruitment of the other staff are some of the important tasks that are to be assigned to the planning staff. Although it would take two to three years for the institutions to come fully into operation, it is hoped that a certain amount of post-graduate and research work and the training of junior teachers would commence much earlier in hired or temporary buildings near the sites.

The Department of Education attach the greatest importance to the early establishment of these institutions for, the sooner they are the sooner will India be free from the necessity of sending overseas a large number of scholars for advanced training in different branches of technology.

It may not be out of place to mention here the following two important matters both of which call for liberal decision, as on this will largely depend the success of these institutions:—

(a) the necessity of offering adequate salaries to teachers so as to attract the best brains to the teaching profession. The present salaries obtaining in the country discourage rather than encourage talented young men to take to teaching posts.

(b) the need for exercising only the barest minimum of governmental control during the formative period of the Institutions. The only way to establish these institutions speedily is to entrust the work to a small Managing Committee empowered to recruit staff, purchase equipment and to take such steps as could expedite the construction of buildings. The grant of such powers to the managing Committee as suggested above would necessarily involve the relaxation of much of the existing rules and procedure.

10. Establishment of the Training College for teachers in Technology.

Financial implications:—

Capital—Rs. 9,81,000.

Annual Recurring—Rs. 1,40,000.

The details of the scheme have been worked out. It is proposed to establish this institution as a Department of the Delhi Polytechnic for the training of teachers for technical high schools and senior technical institutions. For various reasons, such as the inadequacy of teaching accommodation, shortage of staff, equipment, etc., it will not be possible to initiate this scheme for another six months.

11. Establishment of a Central School of Architecture and of an Administrative Staff College.

Financial implications:—

School of Architecture.

Capital—Rs. 1,00,000.

Annual Recurring—Rs. 98,000.

Administrative College.

(*Details are being worked out.*)

The details of these two schemes are now being worked out. The schemes will be ready for implementation in 1948-49.

12. **Effect of intiating the development schemes.**

In addition to the schemes outlined above, some of the Provincial Governments are also initiating schemes for the improvement of the government institutions and the establishment of a few new ones. An attempt has been made to estimate the likely effect on the total output of engineers and technologists from all institutions for India as a whole. Information collected either from replies to a questionnaire issued by the All-India Council for Technical Education or through a direct reference on the subject matter to the institutions concerned has been arranged in the Annexure III, IV, V and VI. Annexure III gives an estimate of the likely annual intake into degree or equivalent courses in different institutions for each branch of technology. Annexure IV gives estimates (a) for the present annual output of engineers and technologists with degree or equivalent qualifications and (b) of their probable output by 1951

and 1954 respectively. Corresponding estimates for Diploma courses are given in Annexure V and VI.

As will be seen from these figures, the annual output of graduates in engineering and technology is expected to rise from its present level of 1,300 to approximately 4,000 by 1954 on the assumption that all the development plans outlined above will be implemented within the next two or three years.

13. **Overseas Scholarship Scheme.**

Financial implications:—

For five years—Rs. 2,40,45,350.

The Overseas Scholarship Scheme was introduced in the year 1945-46 to meet the needs of the Central and Provincial Governments for high-grade technical and scientific personnel. Under this scheme, nearly 1,000 scholars have been sent for advanced education and training in foreign institutions. Some of these scholars are expected to return within the next six months and will be available for employment under the governments.

The scholarship scheme was recently reviewed by an expert committee under Dr. B. C. Roy. It is understood that the Committee has submitted an interim report which is now under consideration of the Government of India and it is anticipated that, as a result of the Roy Committee's recommendations, the scope of the scheme will be considerably widened so as to enable educational institutions, public utility concerns, and industry to participate in it.

14. **Development of the Indian School of Mines, Dhanbad.**

On the recommendations of a Committee of the Works, Mines and Power Department, the Government of India have already initiated a scheme for doubling the training capacity of the Indian School of Mines and improving the standard of education.

15. **Geological Education Committee Report.**

The Parija Committee's report on Geological Education has been under examination by the Universities and Provincial Governments concerned and also by the Government of India. It ought to be possible to give effect to some of the major recommendations within say six months. The schemes drawn up on the lines of the committee's recommendations should, when fully implemented, result in a substantial improvement and expansion of the facilities for undergraduate and postgraduate education in Geology in the Universities of Calcutta, Benares, Aligarh, Bombay (Fergusson College) and Mysore.

16. **Fund for the Promotion of Fundamental Research.**

Financial implications:—

For five years a fund of Rs. 75,00,000

plus

Indian Association.

Capital—Rs. 13,32,000.

Annual Recurring—Rs. 2,71,000.

The Government of India have agreed to provide a fund of Rs. 75 lakhs for the promotion of fundamental research in Universities and research institutions during this quinquennium.

A scheme for the development of the Indian Association for the Cultivation of Science has been sanctioned, under which the association is expected to commence within the next half-year research work in High Polymer Physics and Chemistry.

A scheme for the development of the Tata Institute of Fundamental Research is now under consideration of the Government of India, which, if sanctioned, will be initiated within six months' time.

17. **Divelopment of the Central Universities.**

Financial implication:—

Delhi University.

Capital—Rs. 39,75,000.

Annual Recurring—Rs. 8,56.000.

Benares Lniversity.

Capital—Rs. 20,45,000.

Annual Recurring—Rs. 2,00,000.

Aligarh University.

Capital—Rs. 2,50,000.

Annual Recurring—Rs. 30,000.

The Development programmes which have been already initiated should bring about an all-round improvement of the three Central Universities of Delhi, Aligarh and Benares.

For example, the Delhi University is offering from this year degree courses in some of the biological sciences.

18. **Other Central Schemes for the development of general education.**

Financial implication:—

Training College.

Copital—Rs. 20,45,000.

Annual Recurring—Rs. 2,00,000.

Jamia Millia.

Capital—Rs. 2,50,000.

Annual Recurring—Rs. 30,000.

Visva-Bharati.

Capital—Rs. 4,78,000.

Annual Recurring—Rs. 90,000.

It is hoped to start in Delhi (within six months) a Teachers' Training College which, to begin with, will train 60 graduate teachers. Thirty basic school teachers are being trained in the Jamia Millia Islamia. The Visva-Bharati is expected to commence (also within six months) the training of 30 Music Teachers, 30 Arts and Crafts Teachers and 80 Basic School Teachers.

19. **Practical Training of young Engineers and Technologists.**

One other aspect of Engineers' education deserves special attention, namely, facilities for their post-collegiate practical training.

Past experience has abundantly shown the necessity of more positive steps to ensure that fresh graduates receive adequate field or shop training. Employers including Governments should appreciate that Engineering Colleges cannot provide them with finished products for ready employment in responsible posts and that it would be to their own interest to take in raw graduates and train them up properly. Unless employers willingly face this responsibility and readily undertake to provide facilities for the practical training of young engineering graduates who will be coming out of the Colleges in increasing numbers, the basic object of expanding the facilities for technical education as now envisaged, will be largely frustrated.

20. **Training Officers in Technical Departments of Governments—Apprentice Engineers.**

At present even when a Government Department takes in young engineers for training, their training is hardly ever properly overseen and the graduates ostensibly complete their practical training without improving themselves.

It is suggested that the Technical Departments of the Governments should undertake the task of training a fairly large number of young graduates and for this purpose each of them should have an officer specifically entrusted with the task of looking after their practical training.

At present, a young engineer can get a minor post before taking any practical training and there is a tendency to continue to use him in this minor capacity without further developing his skill.

The best course would seem to be for Departments to take them as apprentice engineers in greater number than their actual requirement for staff and to put them through an all-round training.

ANNEXURE I

Additional output from the Institutions for which Expert Committees of the All-India Council for Technical Education have recommended grants.

Name of Institution	Courses leading to degrees in	Present output	Additional output	Available from the year	Grant recommended by Expert Committees in lacs of rupees
College of Engg. and Technology, Jadavpur.	Mech. Engg., Chem. Engg., Elect. Engg.	200	100	1952	Capital = 26·00 Recurring = 5·00 rising to 7·00
Engg. College, Benares Hindu University.	Mech. and Elect. Engg.	146	14	1952	Capital = 36·126 Recurring = 9·65
College of Mining and Metallurgy, Benares Hindu University.	Mining	16	16	1952	Capital = 17·11
	Metallurgy.	26	17	1952	Recurring = 1·48
College of Technology, Benares Hindu University.	Fuel Technology.	*nil*	25	1952	Capital = 21·28 Recurring = 8·33065
Engineering College, Aligarh University.	Civil Engg.	60	*nil*	Current	Capital = 5·13 Recurring = 2·6
Engg. College, Dayalbagh.	Mech. & Elect. Engg.	*nil*	60	1952	Capital = 17·75 Recurring = 1·33
Victoria Jubilee Technical Inst., Bombay.	Civil Engg.	*nil*	50	1952	Capital = 21·28
	Mech. & Elect. Engg.	*nil*	60		Recurring = 2·003
			40	in 1951	
			20	in 1952	
			10	in 1951	
			10	in 1952	
Dept. of Chemical Technology, Bombay University.	Chemical Eng.	*nil*	20	1952	Capital = 10·30
	Textile Chem.	16	18	1952	Recurring = 1·072
	Chemical Technology	64	17	1952	
	Research.	40	20	1952	
Annamalai University.	Civil Engg. & Mech. Engg	127	*nil*	1949	Capital = 50·00
	Elect. Engg. Chem. Engg.	23	*nil*	1949	Recurring = 0·10

ANNEXURE II

Admission to different departments of the Indian Institute of Science in 1945-46.

Department	New admissions whole-time course	New admissions short-term course	Total number whole-time students in 1945
Physics	11	10	16
Pure and Applied Chemistry	33	6	93
Biochemistry	15	2	33
Electrical Technology	46	3	70
Aeronautical Engg.	20	..	16
Metallurgy	..	..	..
Internal combustion engines	..	..	..
Total	125	21	228

APPENDIX III

ESTIMATE OF ANNUAL INTAKE OF DEGREE OR EQUIVALENT COURSES

Aeronautical Engineering

Indian Institute of Science, Bangalore	20
*College of Engineering (Vizag), Cocanada	20
	approx.
**Engineering College, Hindu University, Benares	20
	approx.
	60
**Eastern H. T. I.	60

Architecture & Building Construction

Delhi Polytechnic, Delhi	30
J. J. School of Art, Bombay	30
	60
**Eastern H. T. I.	90
**Western H. T. I.	90
	180

Chemical Engineering, Chemical Technology and Allied Subjects

Bombay University, Department of Chemical Technology	80
Indian Institute of Science, Bangalore	25
Lakshminarayan Institute of Technology, Nagpur	18
College of Engineering & Technology, Jadavpur, Bengal	70
Delhi Polytechnic, Delhi	40
Annamalai University, Department of Engineering & Technology	23
Benares Hindu University, College of Technology	53
Indian Institute of Sugar Technology, Cawnpore	31
Bangalore Engineering College, University of Mysore	20
Travancore University, College of Engineering Trivandrum	20
Madras University, Department of Chemical Technology	20
**Dacca Engineering College	20
Harcourt Butler Technological Institute, Cawnpore	40
Andhra University, Department of Chemical Technology	30
Calcutta University, Department of Applied Chemistry	16
	506
**Eastern H. T. I.	90
**Western H. T. I.	90
	180

Food Technology

**Eastern H. T. I.	30

Civil and Municipal Engineering

Indian Institute of Science, Bangalore	15
N. E. D. Engineering College, Karachi	80
College of Engineering, Guindy, Madras	44
*Anantpur Engineering College, Madras	20
*Vizagapatam Engineering College	60
*Annamalai University, Department of Engineering & Technology	67
**Benares Hindu University, Engineering College	30
**Dayalbagh Technical College, Agra	20
Travancore University, College of Engineering, Trivandrum	25
**Orissa Engineering College, Cuttack	20
*Birla Engineering College, Pilani, Jaipur	20
Osmania University, Engineering College, Hyderabad Deccan	25
Bengal Engineering College, Sibpur, Howrah	100
Thompson College of Civil Engineering, Roorkee	30
College of Engineering, Poona	100
Bangalore Engineering College, University of Mysore	90
Bihar College of Engineering, Patna	50
Aligarh Muslim University, College of Engineering & Technology	96

**Dacca Engineering College	40
Punjab College of Engineering & Technology, Lahore	40
*Jubbulpore Engineering College	30
	1002
**Eastern H. T. I.	60
**Western H. T. I.	60
	120

Electrical Engineering

Indian Institute of Science, Bangalore	60
N. E. D. Engineering College, Karachi	10
College of Engineering, Jadavpur, Bengal	150
Delhi Polytechnic, Delhi	30
College of Engineering, Guindy, Madras	40
*Anantpur Engineering College, Madras	15
*Vizagapatam College of Engineering, Madras	20
*Annamalai University, Department of Engineering & Technology	30
Benares Hindu University, Engineering College, Benares	70
**Dayalbagh Technical College, Agra	20
Travancore University, College of Engineering	12
**Orissa Engineering College, Cuttack	20
*Birla Engineering College, Pilani, Jaipur	20
Osmania University, Engineering College, Hyderabad, Deccan	25
Bengal Engineering College, Sibpur, Howrah	60
College of Engineering, Poona	20
Thompson College of Civil Engineering, Roorkee	15
Bangalore Engineering College, University of Mysore	40
Bihar College of Engineering, Patna	18
Aligarh Muslim University, College of Engineering & Technology	30
**Dacca Engineering College	30
Punjab College of Engineering & Technology, Lahore	15
*Jubbulpore Engineering College	20
**Sindri Engineering College	30
Calcutta University, Department of Applied Physics	12
Andhra University, Department of Applied Physics	15
	837
**Eastern H. T. I.	90
**Western H. T. I.	90
	180

Geo-Physics

**Eastern H. T. I.	30

Mechanical Engineering

Indian Institute of Science, Bangalore	35
N. E. D. Engineering College, Karachi	10
College of Engineering & Technology, Jadavpur, Bengal	165
Delhi Polytechnic, Delhi	20
College of Engineering, Guindy, Madras	40
*Anantpur Engineering College, Madras	15
*Vizagapatam College of Engineering, Madras	25
*Annamalai University, Department of Engineering & Technology	30
Benares Hindu University, Engineering College, Benares	70
**Dayalbagh Technical College, Agra	20
Travancore University, College of Engineering, Trivandrum	12
**Orissa Engineering College, Cuttack	20
*Birla Engineering College, Pilani, Jaipur	20
Osmania University, Engineering College, Hyderabad (Dn.)	25
Bengal Engineering College, Sibpur, Howrah	80
College of Engineering, Poona	30
Thompson College of Civil Engineering, Roorkee	15
Bangalore Engineering College, University of Mysore	60
Aligarh Muslim University, College of Engineering & Technology	30
**Dacca Engineering College	30

Punjab College of Engineering & Technology, Lahore	15
*Jubbulpur Engineering College	20
**Sindri Engineering College	30
	817
**Eastern H. T. I.	90
*Western H. T. I.	90
	180

Metallurgical Engineering

Indian Institute of Science, Bangalore	20
Benares Hindu University, College of Mining & Metallurgy	20
B. E. College, Sibpur, Howrah	30
	70
**Eastern H. T. I.	30
**Western H. T. I.	30
	60

Mining Engineering

Benares Hindu University, College of Mining & Metallurgy	16
Indian School of Mines, Dhanbad	48
	64

Naval Architecture and Marine Engineering

*Vizagapatam Engineering College, Madras	20 approx.
**Western H. T. I.	90

Textile Technology

V. J. T. I., Bombay	10
Madras University	20 approx.
Sri Krishnarajendra Silver Jubilee Technological Institute, Bangalore	15
	45
**Eastern H. T. I.	30
**Western H. T. I.	90
	120

Research Workers, Teachers & Planners,

**Eastern H. T. I.	500
**Western H. T. I.	500
	1000

NOTE.—*Represents new colleges.

**Represents proposed colleges yet to be established.

APPENDIX IV

Estimate of Annual Output of Engineers and Technologists

Branch of Study	Present annual output	No. of seats planned for in institutions other than Central Govt's proposed Higher Tech. Institutions	Estimated annual output			
			By 1951-52 from Institution other than H.T.I's	From Eastern H.T.I.	From Western H.T.I.	Total from all Institutions by 1954.
Aero-Engineering	15	60	45	42		875
Architecture & Bldg. & Construction.	20	50	45	65	65	17 5
Chemical Eng. & Chemical Technology.	244	506	375	65	65	50 1
Food Technology	—	—	—	21	—	24
Civil & Municipal Engineering.	467	1002	750	42	42	83
Electrical Engineering	285	827	620	65	65	751
Geo-physics	—	—	—	21	—	20
Mechanical Engineering	258	817	613	65	65	743
Metallurgical Engineering	27	70	53	21	21	85
Mining Engineering	27	64	48	—	—	48
Naval Architecture & Marine Engineering.	—	20	15	—	65	80 0
Textile Technology	—	45	34	21	65	12
Research Workers, Teachers, & Planners.	—	—	—	200	200	400
Total	1,343	3,471	2,598	628	653	3,879

APPENDIX V

Estimate of Annual Intake to Diploma, Overseer Or Equivalent Courses

Architecture & Building Construction

Kalabhavan Technical Institute, Baroda	20
	20

Chemical Technology

V. J. T. I., Bombay	20
Kalabhavan Technical Institute, Baroda	25
Harcourt Butler Technological Institute, Cawnpore	19
	64

Civil and Municipal Engineering

V. J. T. I., Bombay	10
N. E. D. Engineering College, Karachi	100
College of Engineering, Guindy, Madras	90
Annamalai University, Department of Engineering and Technology	79
Kalabhavan Technical Institute, Baroda	25
Orissa School of Engineering, Cuttack	50
College of Engineering, Poona	100
Thompson College of Civil Engineering, Roorkee	40
Calcutta Engineering College, Ballygunge, Calcutta	48
Government Engineering School, Nagpur	30
Bihar College of Engineering, Patna	50
Ashanullah School of Engineering, Dacca	120
Aligarh Muslim University, College of Engineering & Tech.	54
Hewett Engineering School, Lucknow	112
	988

Electrical Engineering

V. J. T. I., Bombay	60
N. E. D. Engineering College, Karachi	16
College of Engineering & Technology, Jadavpur, Bengal	14
Dayalbagh Technical College, Agra	12
Osmania Technical College, Hyderabad, Deccan	27
Kalabhavan Technical Institute, Baroda	25
College of Engineering, Poona	25
Calcutta Engineering College, Ballygunge	24
Government Technical Institute, Gorakhpur	20
Aligarh Muslim University, College of Engg. & Tech.	20
Government Technical Institute, Lucknow	12
Government Technical Institute, Jhansi	12
	266

Mechanical Engineering

V. J. T. I., Bombay	60
N. E. D. Engineering College, Karachi	15
College of Engineering & Technology, Jadavpur, Bengal	45
Dayalbagh Technical College, Agra	12
Osmania Technical College, Hyderabad, Deccan	27
Kalabhavan Technical Institute, Baroda	25
Calcutta Engineering College, Ballygunge	24
Government Engineering School, Nagpur	25
Government Technical Institute, Gorakhpur	20
Aligarh Muslim University, College of Engg. & Tech.	15
Jamalpur Technical Institute	25
B. E. College, Sibpur, Howrah	8
Government Technical Institute, Lucknow	12
Government Technical Institute, Jhansi	16
Poona Engineering College	25
Kanchrapara Technical School	19
Parakh Technical Institute, Surat	90
Ashanullah School of Engineering, Dacca	60
	523

Textile Technology

V. J. T. I., Bombay	40
Institute of Textile Technology, Travancore University, Trivandrum	24
Delhi Polytechnic, Delhi	30
Kalabhavan Technical Institute, Baroda	25
Government Central Textile Institute, Cawnpore	47
Bengal Textile Institute, Serampore	60
Sri Krishnarajendra Silver Jubilee Technological Institute, Bangalore	16
Bengal Silk Technology Institute, Berhampore	50
Government Central Weaving Institute, Benares	20
	312

APPENDIX VI

ESTIMATE OF ANNUAL OUTPUT OF PERSONS QUALIFYING IN DIPLOMA & OVERSEER COURSES

Branch of Study	Present Out-put	No. of Seats	Expected out-put by 1951-52
1. Architecture & Building construction	18	20	18
2. Chemical Technology	50	64	55
3. Civil Engineering	641	988	741
4. Electrical Engineering	227	266	200
5. Mechanical Engineering	282	523	400
6. Textile Technology	165	312	234
Total	1,383	2,173	1,648

GIPD—91 MofE—5-1-48—750

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500

BUREAU OF EDUCATION, INDIA

PAMPHLET No. 6

Report of the Second Wardha Education Committee of the Central Advisory Board of Education, 1939, together with the decisions of the Board thereon

(Reprint, 1947)

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PREFACE

At their meeting held at Simla on May 6th and 7th, 1940, the Central Advisory Board of Education had before them the report of the Committee which they appointed in December 1938, to consider further issues arising in connection with the system of basic education such as its relation to other branches of education and the financial problems implicit in its adoption.

The decisions reached by the Board with regard to the various conclusions and recommendations contained in the Committee's report are set out below.

While, as will be seen, the Board were unable to accept the conclusions and recommendations in their entirety, they felt that the report, read in conjunction with the report of the previous Committee appointed by the Board to consider the Wardha Scheme, might well prove a valuable contribution towards the exploration of a most important problem.

The report is accordingly printed on pages 1—27 following and the main conclusions and recommendations referred to in the next paragraph will be found on pages 6—7.

The Central Advisory Board of Education adopted the conclusions and recommendations Nos. 1, 2, 3, 4, 5, 6 and 9. With regard to the others, *viz.*, Nos. 7 and 8, the Board arrrived at the following decisions:—

No. 7.—The Board decided that to implement this recommendation it would be better to strengthen their existing Vernacular Education Committee than to set up a special Committee.

The Vernacular Education Committee was accordingly reconstituted as set out below: it has power to co-opt.

1. Rajkumari Amrit Kaur.
2. The Right Rev. G. D. Barne, C.I.E., O.B.E., V.D., Bishop of Lahore.
3. Mr. R. M. Statham, C.I.E., I.E.S., Director of Public Instruction, Madras.
4. Mr. W. H. F. Armstrong, I.E.S., Director of Public Instruction, Punjab.
5. Dr. Sir Zia-ud-Din Ahmad, C.I.E., Ph.D., D.Sc., M.L.A.
6. Pandit Amaranatha Jha, M.A., Vice-Chancellor, Allahabad University.
7. Mr. J. M. Bottomley, I.E.S., Director of Public Instruction, Bengal.
8. The Educational Commissioner with the Government of India.
8. The Educational Commissioner with the Government of India.

of the Committee, the official members representing the Government of India expressed their inability to commit themselves in any way. The representative of the Legislative Assembly attending the meeting felt himself precluded under existing circumstances from supporting the Committee's recommendation. One or two members, while in favour of the principle that the Central Government should make some contribution, found themselves unable to go as far as the Committee desired.

The Board also decided that—

(a) a copy of the Report, together with the decisions of the Board in regard thereto, should be forwarded to the Provincial Governments for consideration and such action as they might consider necessary;

(b) their thanks be expressed to the Chairman and members of the Committee for the great amount of time and care which they had obviously devoted to the preparation of the Report.

For convenience and in order that the Board's attitude towards the system of 'basic' education as a whole may be made clear, the report of the Board's first Committee on the Wardha Scheme which was adopted by the Board without alteration in December 1938, is reprinted as an appendix.

REPORT OF THE SECOND WARDHA EDUCATION COMMITTEE OF THE CENTRAL ADVISORY BOARD OF EDUCATION, 1939.

The Central Advisory Board of Education at its meeting held in January 1938 appointed a Committee under the chairmanship of the Hon'ble Mr. B. G. Kher, Premier and Education Minister, Government of Bombay, to examine the scheme of educational reconstruction incorporated in the Wardha Scheme in the light of the Wood-Abbott Report on General and Vocational Education and other relevant documents, and to make recommendations. This Committee submitted its report to the Board on the 3rd December 1938. During the consideration of this Report, which was generally adopted by the Board, certain issues emerged such as the co-ordination of the 'basic' system with higher education, the ways and means to finance it, etc., which in the opinion of the Board required further examination. With this object in view, the Board appointed another Committee consisting of the following members with powers to co-opt:—

The Hon'ble Mr. B. G. Kher, Premier and Education Minister, Government of Bombay, *Chairman*.

The Hon'ble Qazi Ataullah Khan, Minister of Education, Government of the North-West Frontier Province.

Rajkumari Amrit Kaur.

Mrs. Hansa Mehta, Parliamentary Secretary for Education to the Hon'ble the Prime Minister, Bombay.

Dr. Zakir Husain, Principal, Jamia Millia Islamia, Delhi.

Pandit Amaranatha Jha, M.A., Vice-Chancellor, Allahabad University.

Dr. W. A. Jenkins, D.Sc., I.E.S., Director of Public Instruction, Bengal.

Mr. W. H. F. Armstrong, I.E.S., Director of Public Instruction, Punjab.

The Educational Commissioner with the Government of India.

The Board also suggested that the Committee should, if possible, visit places where the 'basic education' scheme is in operation.

2. In accordance with the powers conferred on the Committee by the Board, the following were co-opted as additional members:—

The Hon'ble Mr. C. J. Varkey, Minister of Education, Government of Madras.

The Hon'ble Pir Illahi Baksh Nawaz Ali, Minister of Education, Government of Sind.

Mr. J. C. Powell Price, I.E.S., Director of Public Instruction, United Provinces.

3. The Committee as finally constituted held two meetings; the first in Simla on the 12th and 13th June, and the second at Poona on the 29th October 1939. Mr. Powell Price was unable to attend either meeting and the Hon'ble Mr. Varkey and Dr. Zakir Husain were unable to attend the second meeting. It proved impossible to arrange for the Committee as a whole to visit places where the "basic education" scheme is in operation, but personal visits were paid by most of the members to some or all of these places.

4. The agenda and papers circulated therewith to the members of the Committee are set out in Appendix I.

A copy of the resolutions passed by the All-India Muslim Educational Conference and of notes on the agenda by the Hon'ble Pir Illahi Baksh, both of which were circulated to members of the Committee, will be found in Appendices II and III, respectively.

5. *"Pre-basic" education.*—The original Wardha Scheme advocated the free and compulsory education of all boys and girls between the ages of 7 and 14, though girls might be withdrawn after the completion of their 12th year if their guardians so desired. The Zakir Husain Committee recognised the importance of providing educational facilities for children below the age of 7 and envisaged the possibility of this being done on a voluntary basis with State help where possible, but did not feel justified in including it as a part of the compulsory scheme in view of financial and other considerations. The report of the first Kher Committee, as adopted by the Central Advisory Board of Education, contemplated the period of compulsory education as extending from the age of 6 to the age of 14 for all children.

The Committee fully recognise the importance in the child's educational life of the years 5—7. During this period the foundation of good habits, mental moral and physical can be laid and the effects of childish ailments detected and remedied more easily and more effectively than at any later age. They understand that in many provinces at the present time children are admitted to the infants classes of primary schools at about the age of 5 and that parents are often glad to be able to leave their children during the day where they will not only be looked after but will also receive some useful training. They also appreciate the fact that where parents have acquired the habit of sending their children to school at an early age the difficulties of enforcing attendance when the compulsory stage is reached will be considerably reduced. They are accordingly anxious that facilities for education at the 'pre-basic' stage, so far from being reduced, should be widely extended by increasing the number of infants classes in State schools and by encouraging the establishment of efficient 'pre-basic' schools by voluntary agencies. They also suggest that Provincial Governments should set up a few model infants schools where the correlation of Kidergarten instruction with the curriculum of the 'basic' school may be studied and developed. The Committee do not, however, consider that it is practicable at the present stage to lower the minimum age of compulsory attendance below 6 years. To do so would add substantially to the serious financial problems already involved by the 'basic education' scheme and would also assume an adequate supply of properly trained women teachers, since children at this early age should be taught by women and not by men. Such a supply is practically non-existent in India at the present time. Steps should be taken to create it, either by adding special courses in infants teaching to existing training schools or by establishing special institutions for this purpose. The Committee were interested to learn that in certain provinces the possibility of utilising the services of widows in this connection was being explored and believe that this source of recruitment may be further enlarged. In the meantime, however, pending the solution of the two major problems referred to above the Committee are of opinion that 'pre-basic' education, when provided by the State, should be free but not compulsory.

6. *'Basic' education and its division into two stages.*—A 'basic' school as at present conceived would appear to constitute a unit by itself for children between the ages of 7 and 14. The protagonists of the 'basic education' scheme are rightly insistent that the whole course should be regarded as coherent and consecutive. There is nothing, however, in this conception which conflicts with the view generally accepted by educationists to-day that the mental and physical changes which boys and girls undergo as a rule about the age of 11—12 should be recognised by corresponding adjustments both in the content of the curriculum and in the methods of instruction. Hence arises the need for treating the instruction given before and after this psychological break as forming two well-defined stages, each with its own scope, aims and technique though inspired by the same fundamental aim. It was for this reason that the Central Advisory Board of Education, when formulating a framework of educational organisation at its first meeting in 1935, recommended an

organisation consisting of a primary stage, a lower secondary stage, and a higher secondary stage. There is, in fact, nothing novel so far as India is concerned, about the idea of a break at about the age of 11—12, as every province makes a distinction between primary and secondary or middle education, though the dividing line is at the end of the fourth class in some cases and at the end of the fifth in others. Nor is there anything in the general conception of the 'basic education' scheme which is repugnant to the notion that the onset of adolescence should receive recognition by a suitable differentiation in the scope and method of instruction. The principle of 'learning by doing' is equally applicable in the primary and in the post-primary school, only its practical interpretation needs adjustment to the growing powers and changing interests of the children. Moreover, if opportunities are to be provided for children to transfer from 'basic' schools to other forms of post-primary education and if as the Committee contemplate, the 'basic' school is to become the normal type of primary school not only in rural but also in urban areas, where the number desiring such transfers is likely to be much greater, a break in the organisation at about the age of 11—12 will become a matter of normal convenience as well as of educational desirability. It is obviously important that a child, if and when he transfers, should have completed a planned stage in his school career. Apart from those likely to be transferred to other forms of post-primary education—and they will be a comparatively small minority—there is an equally strong argument in the case of the remainder for a break between the primary and post-primary stages. The organisation of practical activities and their correlation with other subjects will be more effective and less expensive at the post-primary stage, from the point of view both of grading pupils according to their intelligence and of economising staff, accommodation and equipment, wherever it is possible to provide a central school to serve a number of contributory primary schools. This will be possible as a rule in towns and in those rural areas where villages are fairly large and close together. Finally, boys and girls, who under satisfactory arrangements may be educated together during the primary stage, will have to be taught separately subsequently. Provision for their post-primary education will be much facilitated if they can be collected in sufficient numbers into 'basic' post-primary central schools.

After serious consideration of this most important problem the Committee reached the conclusion that the divergence between those who regard the 'basic' course as one and indivisible and those who realize the need for a break between about the age of 11—12 is more apparent than real. For those children—and they will be the great majority—who remain to the end of their school career under the 'basic' system, there will be no break in the continuity or aim of the instruction, and such a break as there may be will be only a transference from one 'basic' school to another. For those who pass to other forms of post-primary instruction, the effects of the change will be minimised if the curriculum of the institutions in question is closely related, as the Committee recommend, to that of the 'basic' school. The Committee accordingly are agreed that 'basic' education should comprise a correlated course of eight years from the age of 6 to the age of 14, which for the sake of convenience should be divided into two stages—the first stage covering a period of 5 years and the second stage 3 years. The first stage should be called "junior" and the second stage "senior". Moreover, the curriculum for all schools beyond the 'junior basic' stage, whether 'senior basic' or other forms of post-primary education should develop logically from that of the 'junior basic' school.

7. *Transfer of children from 'basic' schools to other schools.*—The Committee contemplate that the 'basic' school will be the normal type of school attended by all children up to the end of the 'junior' stage. They realise, however, that after that stage certain children, and particularly those who may be intended for a university career, will transfer to schools of a different type

from the 'senior basic' school. The Committee feel that arrangements should be made for such transfers in the case of children who have completed the fifth grade in 'basic' schools and shown the necessary aptitude for benefiting by a course of higher education. Without desiring to prescribe in any detail the nature of such a course, the Committee lay emphasis on the fact that the curriculum should derive naturally from that of the 'junior basic' school, but should vary in its later stages to meet both the differing aptitudes of the pupils and the requirements of the occupations they intend to enter on leaving school. These variant forms of higher education should extend over a minimum period of 5 years, with a further course of more advanced work for those who intend to proceed to a university or enter occupations for which a more prolonged course of study is regarded as essential. It may be convenient for such diversified courses to be given in separate institutions and the possibility of developing Technical High Schools in or in connection with existing Technical Colleges, as forms of higher education alternative to that provided by the normal high school, should receive careful consideration. It is particularly important that subject to the over-riding right of the parent to make the final decision, the school to which a child should go at the conclusion of the 'junior basic' stage should be determined primarily by the special aptitudes he has displayed during this stage. In any area where compulsory education up to 14 is in force, a child will remain under obligation to attend school to that age whatever the type of school he may be attending.

While those children whose general intelligence or future careers make it obvious that they cannot complete their education in a 'senior basic' school, should be transferred at the end of the fifth class wherever possible, provision must also be made for those children who wish to continue their education after completing the course at the 'senior basic' school. Special arrangements must be made so that such children may receive special tution in those subjects, *e.g.*, English which do not form part of the curriculum of the 'senior basic' school.

As regards the relation of the post primary schools other than the 'senior basic' with university courses, the Committee did not consider it desirable to go into details, as it is for the universities to prescribe their own courses. They feel, however, that it is by no means impossible for the responsible educational authorities to relate the instruction provided in such schools to that of the 'junior basic' school at one end and of the university at the other.

8. *Parallel course of instruction for girls in the upper classes of 'basic' schools.*—The Wardha Scheme, while allowing girls to be withdrawn from 'basic' schools after the completion of their 12th year if their guardians so desire, clearly did not contemplate that the education of all girls would cease at this stage. The Central Advisory Board of Education assume that compulsion up to the age of 14, if and when introduced, will apply to girls as well as to boys. A suitably modified syllabus will therefore be necessary for those girls who continue their education in 'senior basic' schools. The Committee accordingly recommend that courses should be framed specially suited to the aptitudes and requirements of older girls and should include such subjects as cookery, laundrywork, needlework, homecrafts, the care of children, first aid etc., the rest of the instruction being correlated with these practical activities in accordance with the general principles of the 'basic education' scheme.

9. *Appointment of a standing committee to watch educational developments.*—Provinces are now embarking on new educational experiments and the system of 'basic education', which many of them are introducing, is still in the experimental stage. It will be advantageous if the results of all these experiments are watched and co-ordinated by some central body. The Committee, therefore, recommend that a standing committee of the Central Advisory Board of Education be appointed to survey the general progress of educational developments in all the provinces, with special reference to 'basic' education, and to make recommendations to the Board for necessary action

from time to time. This standing committee should contain a represenative of the Hindustani Talimi Sangh.

10. *Central Bureau of Information.*—The syllabus outlined in the Zakir Husain Report is admittedly tentative and is likely to require adjustment in the light of local conditions. The interpretation of the syllabus in this connexion, the extent to which a particular topic or craft is to be introduced and the nature of the incidental information to be given to children at any given age are problems which require to be carefully handled. The Committee considered whether any organisation such as a central bureau, through or by which these and similar problems can be elucidated, should be set up, but came to the conclusion that as this was essentially a matter for local decision it was not necessary to create a central bureau at this stage.

11. *Ways and means to finance 'basic' education.*—The framers of the original Wardha Scheme hoped that while such education during the earlier stages might not be productive yet for the whole period of seven years it would be self-supporting. The Wardha Conference which met in 1937 to consider this scheme was not convinced that it could or should be made self-supporting although it considered that it would gradually be able to cover the remuneration of teachers. The Zakir Husain Committee also doubted whether such education could be made entirely self-supporting and while expressing the opinion that 'basic' education should cover the major portion of its running expenses, stated that all other educational expenditure, *e.g.*, on buildings, equipment, etc., must be met from other sources, public and private. The Committee of the Central Advisory Board of Education appointed in 1938 to consider this scheme also pointed out that 'activity' schools would cost more to run in the beginning than the present type of school. It may now be accepted that no school, 'basic' or otherwise, which devotes itself to its proper function is likely to be an entirely self-supporting unit. This, however, is no reason why the marketable articles it produces should not be sold as advantageously as possible. After this and other possible sources of income have been fully explored, the balance of the cost of providing a compulsory system of education, which must be free, will have to be met from public funds.

The provision of such education as is necessary for its own stability and the well-being of its citizens is a fundamental responsibility of the democratic State—a responsibility which should be divided equitably among those authorities which are concerned with educational administration. In countries like England, about 50 per cent. of educational expenditure comes from the Central Government and the rest is found from local sources. In India, the authorities concerned are the Central Government, the Provincial Governments and the local bodies entrusted with educational powers. Each of these authorities must contribute their share of the net cost of education, *i.e.*, the total cost after receipts from fees, voluntary contributions and the sale of articles made in school have been deducted. Apart from this general consideration the Committee are satisfied from figures submitted to them that the cost of introducing a free and compulsory system of 'basic' education between the ages of 6 and 14 is beyond the existing financial capacity of any provincial Government or local body, a minimum estimate of the net cost being Rs. 2 per head of population per annum. As they are convinced that the future of India must depend very largely on such a system being introduced without delay, the Committee have no alternative but to recommend that the Central Government should contribute not less than half the approved net expenditure of a Provincial Government on this particular service. Such a contribution would naturally be contingent on the Provincial Government (a) raising the remaining sum required from its own resources (b) undertaking to pay an agreed minimum scale of salaries to its teachers and (c) satisfying the Central Government that the amount is spent on free and compulsory education. The Committee further suggest that in order to lighten the immediate burden of the non-recurring expenditure required to bring the scheme into operation the cost of all sites,

buildings, equipment, etc., exceeding Rs. 5,000 for any single item should be met from loan.

12. *Disposal of the produce of schools.*—The 'basic education' scheme centres round a productive basic craft. Means will have to be devised for the disposal of the marketable articles thereby produced. An economical method of marketing is essential, and as this is beyond the scope of any individual school, it will only be possible if a central agency in each province undertakes this work. The Committee do not mean by this that there should be only one central depot in each province for collecting and selling articles produced at school but that the Provincial Government in each case should undertake direct responsibility for this organisation.

13. *Resolutions of the All-India Muslim Educational Conference.*—The Committee also gave careful consideration to the resolutions submitted on behalf of the All-India Muslim Educational Conference and were gratified to find that on all major educational issues there was a substantial measure of agreement between the decisions of the Conference and their own conclusions.

14. *Main conclusions.*—The following is a summary of the Committee's main conclusions:—

(1) That while the provision of 'pre-basic' education in Nursery and Infants schools and classes is highly desirable, it is not practicable at this stage, in view of the lack both of money and of trained women teachers, to advocate its introduction on a compulsory basis. Provincial Governments should aim in the first place (a) at providing model Infants and Nursery Schools in suitable centres, (b) at increasing the supply of properly trained infants teachers, who should be women, (c) at encouraging the enrolment in 'basic' schools of children below the minimum age for compulsory attendance and (d) at stimulating the provision by voluntary agencies of efficient 'pre-basic' schools.

(2) That 'basic' education should comprise a course of eight years from the age of 6 to 14 years and that this course while preserving its essential unity should consist of two stages—the first stage, the 'junior' stage, covering a period of 5 years and the second stage, the 'senior' 3 years.

(3) That the transfer of children from the 'basic' school to other form of post-primary education should be allowed after the 5th grade, *i.e.*, at the conclusion of the 'junior basic' stage.

(4) That the various types of post-primary school (other than the "senior basic" school) to which suitable children may be transferred at the end of the 'junior basic' stage should provide a variety of courses extending over a period of at least five years after the age of 11. These courses, while preserving an essentially cultural character, should be designed to prepare pupils for entry to Industrial and Commercial occupations as well as to Universities.

(5) That special arrangements should be made in these schools for assimilating pupils who decide to continue their education after completing the full course in the 'basic' school, *i.e.*, after reaching the 8th class.

(6) That suitable courses should be framed for girls attending 'senior basic' schools, which should include such subjects as cookery, laundry work, needle work, homecrafts, the care of children and first aid, the remainder of the instruction to be correlated with this course of domestic science in accordance with the general principles of the 'basic education' scheme.

(7) That a standing committee of the Central Advisory Board of Education should be appointed to watch new educational experiments carried on in the provinces as well as the progress of educational developments generally, with special reference to 'basic' education, and to make recommendations to the Board for necessary action. There should be a representative of the Hindustani Talimi Sangh on this Committee.

(8) That subject to such conditions as are set out in the report the Central Government should contribute not less than half the amount of the approved net recurring expenditure on 'basic' education in each province, the balance to be found by the Provincial Government and the local bodies entrusted by it with the administration of compulsory education. For capital expenditure on buildings, equipment, etc., a loan system should be adopted.

(9)) That a central agency should be established in each province for the disposal of marketable articles produced in schools.

B. G. KHER (*Chairman*).
Q. ATAULLAH.
AMRIT KAUR.
HANSA MEHTA.
ZAKIR HUSAIN.
AMARANATHA JHA.
W. A. JENKINS.
W. H. F. ARMSTRONG.
JOHN SARGENT.
J. C. POWELL-PRICE.
PIR ILLAHI BAKSH.
C. J. VARKEY.

NOTE OF DISSENT BY MR. J. C. POWELL-PRICE.

While agreeing with the main conclusions of the Committee, I am unable to subscribe to the theory that Pre-Basic Education should not be the concern of Government. In India there is only one agency which can be entrusted with elementary education and that is Government. The Infants class is an integral part of primary education and should in no case be separated. The nursery school is a totally different proposition and it only leads to confusion to class Infant and Nursery classes together. I cannot, therefore, agree with conclusion No. 1.

APPENDIX I.

(1) AGENDA.

1. To consider whether compulsion should be introduced from the age of 6 to 11 years in the first stage or from the age of 7 to 14 without any preliminary stage: in this connexion to consider whether in the event of the principle of compulsion applying up to the upper age limit of 14 years and a pupil of a "basic" school being transferred to another type of school at the age of 11 this pupil should be subject to compulsory attendance at that school until he attains the age of 14.

2. To consider what entire educational system should be aimed at in a province, what should be the aims, not inconsistent with the above general aim, for complete "basic" education for children aged from 7 to 14 years, or separately from 6 to 11 and 12 to 14 years and how far these should be complete in themselves and how far only a step towards the higher stages.

3. To consider the question of the co-ordination of the Wardha Scheme with higher education.

4. To consider the desirability of the division of the "basic" school into primary and upper primary schools or stages and the examination of the curriculum in the light of this possible division.

5. To consider the question of the transfer of children from the "basic" school at the age of 11 plus to other schools.

6. To consider what type of schools for higher education should be set up for those pupils who leave the "basic" schools at the end of five years (age 11) and what should be the conditions, if any, for the admission of such pupils to these schools, and what should be the difference in the curriculum of these two types of schools.

7. To consider what type of secondary (lower and higher) schools should be established to serve the needs of pupils who may join them after completing the full term of "basic" education.

8. To consider what should be the duration and the educational content of these "post-basic" schools.

9. To consider what vocational specialisation may be suitably provided in these schools on the basis of regional and occupational characteristic of their location.

10. To consider the desirability of providing for parallel courses of instruction for girls in the upper classes of "basic" schools.

11. To consider what relation the "post-basic" schools should have with the university courses.

12. To consider the question of the provision of "pre-basic" education schools and the syllabus for the same.

13. To consider the question of the training of nursery school teachers and the recruitment of more women teachers generally.

14. To consider the question of ways and means to finance the Wardha Scheme.

15. To consider whether it is desirable or practicable for the State to finance "post-basic" and college education.

16. To consider the desirability of establishing a Board to co-ordinate the work of "basic" education undertaken as an experiment or otherwise in various provinces of the country.

17. To consider the desirability of starting a central bureau to supply uniform literature on the topics included in the curriculum of "basic" schools.

18. To consider the question of the disposal of the produce of children's activities.

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(2) NOTE ON THE ACTION TAKEN, OR PROPOSED TO BE TAKEN, BY THE PROVINCIAL GOVERNMENTS ON THE WARDHA EDUCATION SCHEME

While considering the Report of its Committee on the Wardha Education Scheme at its last annual meeting held in December 1938, the Central Advisory Board of Education felt that certain points such as the co-ordination of this scheme with higher education, the ways and means to finance it, etc., required further consideration and appointed another Committee to examine these and any other matters arising out of the Wardha Scheme. It also suggested that the Committee, if possible, should visit places where this scheme is already in operation. The provincial authorities were requested to supply information as to any schemes or other material which might be useful to the Committee in considering the questions referred to them and to suggest schools within their jurisdiction, if any, where the Wardha Scheme had been in operation for a sufficiently long time to justify a visit by the Committee. The information received from them is as follows:—

Madras.—There is no recognised school in this province in which the Wardha Scheme has been in operation.

Bombay.—The Government of Bombay have sanctioned a scheme to open about 100 "basic" schools from June 1939,—60 in your compact areas and 40 in isolated places. There is, however, one school at Thamna in the Kaira district which has been working on the lines of the Wardha Scheme for some 8 months. This school is working under the supervision of one Mr. Narharibhai Parikh of the Sabarmati Ashram, Ahmedabad.

The Government of Bombay have further expressed the following views as regards certain matters connected with the Wardha Scheme:—

(a) In this province there are infants classes in all primary schools where children are sent at the age of 5 or even 4. So long as these classes are maintained, it will not be possible to refuse admission to such children. In rural areas people regard such classes as a kind of crèche and under present circumstances, it is desirable to provide some useful occupation for children of this age.

(b) The general trend seems to be in favour of co-education in "basic" schools up to the age of 11 *plus*, girls to be allowed to drop out at about 12 years of age. This does not mean that all girls will drop out and a suitably modified optional syllabus will be necessary for those girls who continue their education in "basic" schools after this stage.

(c) The Wardha Educational Committee of the Central Advisory Board of Education has suggested various forms of activity serving as a preparation for, and developing into, a productive basic craft in higher classes. Suggestions are invited with regard to the disposal of the marketable articles thereby produced.

(d) The syllabus outlined in the Zakir Husain report is admittedly tentative and is likely to require adjustment in the light of local conditions. The interpretation of the syllabus in this connection, the extent to which a particular topic or craft is to be introduced and the nature of the incidental information to be given to children at any given age are problems which require to be carefully handled and some organisation such as a central bureau through or by which these and similar problems can be

cleared up will be a great advantage. A Board to co-ordinate the work of basic education, undertaken as an experiment or otherwise, is also desirable in the various provinces.

Bengal.—This province has not as yet started any schools on the Wardha Scheme nor does it contemplate doing so in the near future.

United Provinces.—A committee appointed by the Provincial Government has submitted an interim report recommending the adoption of the Wardha Scheme with certain modifications. A Basic Training College for Men was accordingly started in August 1938 at Allahabad where graduates are being trained in the "basic" system of education. An experimental "basic" school consisting of classes I and II, where the actual system is being worked out, has been attached to the College. A Basic Training College for Women was also started in September 1938 and has been placed under the charge of the Principal of the Basic Training College for Men.

In January 1939, two teachers from each district board were sent to the Basic Training College to undergo a three months' refresher course in the 'basic' system of education. These courses have now been finished and the Government have started refresher courses from the 1st May for about three months at the headquarters of the seven Inspectorial districts in the province where primary school teachers from district and municipal boards are undergoing training in the methods of "basic" education. It is proposed to have 250 teachers trained at each centre on these lines by graduates turned out from the Basic Training College under the guidance of a member of the staff of the Basic Training College. These teachers will finish their training by the 15th of July and will be sent back to their districts to open at least 30 schools in each district board and at least 5 schools in each municipal board. These schools will be called "basic" schools.

From August 1, another refresher course will be started in the same way for three months and the teachers who attend the course will be required to open another 35 schools. A further course on similar lines will commence in November. In February another course will be run to open class II in some of the above "basic" schools from July 1940. The teachers in their refresher courses will be trained in the principles of "basic" education, general science, civics, handwork including cardboard work, bookcrafts, spinning and gardening.

Punjab.—There are no "basic" schools in this province. A scheme has, however, been drawn up embodying certain features of the Wardha Scheme.

Bihar.—The Patna Training School has turned out one emergency batch of Wardha Scheme teachers; it begins with a second batch in June. The fixst emergency batch of teachers started work in schools at Brindaban, near Bettiah, North Bihar, in April 1939. There are 35 "basic" schools in the area.

The Director of Public Instruction, Bihar, has further expressed the following views as regards certain matters connected with the Wardha Scheme:—

(a) Compulsion should be introduced from seven to fourteen years without any preliminary stage.

(b) Children may branch off to other schools at the age of 12, or after completing the fifth grade of the "basic" school.

(c) A sub-committee has been appointed to work out the cost of the Wardha Scheme. It has not yet submitted its report.

(d) No special training for nursery school teachers is envisaged so far. With the general impetus given to girls' education, a steady supply of women teachers may be anticipated.

Central Provinces.—With the object of implementing the Provincial Government's resolution accepting the syllabus prepared by the Zakir Husain

Committee (*viz.*, the 'official' Wardha syllabus), it is proposed to introduce the syllabus in primary schools in a compact area in the Wardha district in the first instance and in the light of experience gained to extend the working of the syllabus to primary schools throughout the province. As regards the training of teachers it is considered necessary that not only primary school teachers but also the staff of normal schools in the province should be trained in the Wardha, syllabus. A programme with this object in view has accordingly been drawn up and will be in operation at the Vidya Mandir Training School, Wardha, from the 15th April 1939 to the 30th April 1940. This Training School has already primary classes both in Hindi and Marathi, which with some extension on the Hindi side, can serve as practising classes for the Wardha District Council teachers (under training) while the Wardha District Council teachers themselves will constitute practising classes for the Government secondary and normal school teachers under training. As these teachers will be drafted for training in batches and as the courses will be concentrated in short terms of about 5 months each, the existing Vidya Mandir Training School and Practising School staff will need to be strengthened. It will also be necessary to provide additional staff of a sufficiently high calibre and academic status for the retraining of Government normal school staff. In order to release the Government normal school staff for this training, it is proposed to suspend formation of the 1st year classes in Government normal schools throughout the province for 1939-40 only. The resultant saving in stipends contingencies, etc., in Government normal schools will counterbalance the expenditure involved in the proposed scheme of the Wardha syllabus training at the Vidya Mandir Training Institute.

There are at present 44 schools maintained by the District Council in the Wardha District of the province where the Wardha Scheme has been in operation since the 1st of January 1939.

Assam.—As an experimental measure the provincial Government have provided in the current year's budget a sum of Rs. 1,000 to encourage the study of Hindustani and also Rs. 1,200 for the training of teachers of "basic" schools under the Wardha Scheme. It is proposed to appoint a committee, if necessary, to consider the whole question in due course.

North-West Frontier Province.—The Provincial Government have not, so far, been able to introduce the Wardha Scheme in any school in this province. It is proposed to send four teachers during the current year to undergo training at the Jamia Millia, Delhi, and, on their return, to post them to two or three specially selected schools in order to give this new experiment a trial. Last year, a district inspector, a headmaster of a high school and two teachers of the Peshawar Training School for men were sent to Wardha for a fortnight to see the scheme in operation. All of them submitted reports on their return in which they advocated the introduction of the scheme. The Provincial Government, however, could not do so at the moment because of the lack of teachers trained in the new system and also because of certain other difficulties. It is, however, proposed to introduce the scheme in this province as early as possible.

Sind.—The Wardha Scheme has not so far been tried anywhere in this province. A committee of educational experts is shortly to be appointed by the Provincial Government to consider all educational schemes including the Wardha Scheme, and to evolve a scheme which will suit Sind conditions. As regards the financing of the Wardha Scheme, it is stated that this scheme even on the basis of a seven-year duration (ages 7 to 14) and not an eight-year duration (ages 6 to 14) as recommended by the Committee appointed by the Central Advisory Board of Education will make the Government of Sind responsible for the "basic" education of 4 lakhs of children in any normal year

after the introduction of compulsion throughout the province. In view of the extra cost of an education based on an activity curriculum and of the large number of teachers of a new type and the three-year course of training which the Wardha Scheme contemplates, it is estimated that the cost of education per child under the Wardha Scheme will be not less than Rs. 25 annually. The annual cost under present condition is Rs. 23. With 4 lakhs of children between the ages of 7 and 14 in Sind, the annual total cost for "basic" education alone will be over one crore of rupees. This expenditure is beyond the present financial resources of the province. In view of this the education department of Sind will favour the evolution of its own scheme of education which, while achieving the necessary reorientation in the light of some of the basic principles of the Wardha Scheme, will keep the expense of the new undertaking within attainable limits. Till the contemplated provincial reorganisation committee has investigated this problem, it cannot be indicated with any degree of finality how the new scheme will be financed. But if vastly increased expense is called for, as is certain the following measures (some or all) are suggested to finance it:—

(a) Substantial annual grant from the Government of India, particularly to poor and backward provinces like Sind.

(b) An education cess, an employment tax, or some other form of levy to be earmarked specially for education.

(c) Donation of lands and buildings from charitable individuals and institutions on the lines of the Vidya Mandir Scheme.

(d) Sale of articles of marketable value produced by pupils in the higher stages of "basic" education.

(e) Introduction of compulsion up to the age of 11, and leaving the later stages of "basic" education to be worked on a voluntary basis by private agencies under a system of grants and Government inspection.

(f) Reduction of expenses by means of cheaper designs of school buildings and equipment, by utilising, when possible, the community or religious houses as schools, by having part-time schools, etc.

(g) Leaving higher education to private effort, the State spending only the minimum on organisation, inspection, etc.

(h) Conscription of the educated youth of the province for a year or two in each case for service in the "basic" schools.

As regards the training of nursery school teachers and the recruitment of more women teachers generally, it is stated that in view of the consensus of opinion favouring the age-range of 7—14 for "basic" education, it will be necessary to start nursery schools in all the provinces. The education department of Sind considers that as much of the activity in these schools will be in the nature of play and educative entertainment, a simple course of training extending over a few months will meet the situation, and this should be supplemented by the issue of suitable literature for the teachers from time to time and by the occasional holding of refresher courses. Educated girls might be encouraged to start nursery schools in their own homes or in public gardens or in groves of trees, and so on. There is also another way in which recruitment of more women teachers would be made possible. The last two years of "basic" education for girls when they are between 12 and 14 years of age should be so arranged as to give them an idea of the methods and spirit of nursery schools and to leave them free by rotation to go and work in the nursery schools as part of their "basic" education. It is considered that under

this arrangement a large number of women teachers for nursery schools will ultimately be found who will be already conversant with the spirit of "basic" education and likely therefore to prepare the children from the ages of 4 to 6 for eventful admission to "basic" schools.

Orissa.—"Basic" schools in this province will start work from the 1st January 1940. A training school for preparing teachers of these "basic" schools will start on the 1st June 1939.

2. As regards the question of visits of the Committee, the Director of Public Instruction, United Provinces, has stated that this year the schools will only have class I teaching under the new system and there will not, therefore, be much for the Committee to see in that province. He is of opinion that members of the Committee will obtain a better insight into the way the Wardha Scheme works if they visit the demonstration school in the Basic Training College at Allahabad at the end of July or in August. Methods of training, or rather "reconditioning", primary school teachers may also be seen at any of the centres in the Inspectorial districts which will also have a demonstration school attached. In their case, however, it will be merely a demonstration school as a practising school is impossible owing to the large numbers involved. The school at the Basic Training College, Allahabad, will however be a practising school.

The Director of Public Instruction, Central Provinces, has suggested that the Committee might visit some of the 44 schools maintained by the District Council in the Wardha district where the Scheme has been functioning since the 1st January 1939.

The Director of Public Instruction, Bombay, suggests a visit to the school at Thamna in the Kaira District which has been working on the lines of the Wardha Scheme for about 8 months.

The Director of Public Instruction, Bihar, has suggested that the Patna Training School may be worth visiting and that the "basic" schools started at Brindaban may also be visited by the Committee.

3. Apart from the information supplied by the provinces, there is a training school attached to the Jamia Millia Islamia, Delhi, which provides for the training of teachers for "basic" schools.

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(3) SUMMARY OF THE PROCEEDINGS OF THE FOURTH ANNUAL MEETING OF THE CENTRAL ADVISORY BOARD OF EDUCATION HELD IN NEW DELHI ON THE 3RD DECEMBER 1938, REGARDING THE WARDHA EDUCATION SCHEME.

In January 1938, the Central Advisory Board of Education appointed a Sub-Committee under the chairmanship of the Hon'ble Mr. B. G. Kher, Premier and Education Minister, Government of Bombay, to examine the scheme of educational reconstruction incorporated in the Wardha scheme, to consider this in the light of the Wood-Abbott Report on General and Vocational Education in India and other relevant documents and to make recommendations. The Sub-Committee submitted its report to the Board on the 3rd December 1938. Its main recommendations were—

(a) The scheme of "basic" education should first be introduced in rural areas.

(b) The age range for compulsion should be 6 to 14 years, but children can be admitted to the "basic" school at the age of 5.

(c) Diversion of students from the "basic" school to other kinds of school should be allowed after the 5th class or about the age of 11 plus.

(d) The medium of instruction should be the vernacular of the pupils.

(e) A common language for India is desirable. This should be Hindustani with both the Urdu and Hindi scripts. Option should be given to children to choose the script and provision should be made for teaching them in that script. Every teacher should know both scripts, *viz.*, Urdu and Hindi. Some members of the Committee suggest that the adoption of Roman script might prove a solution to the language difficulty and greatly minimise the work of both scholar and teacher.

(f) The Wardha scheme of "basic" education is in full agreement with the recommendations made in the Wood-Abbott Report so far as the principle of learning by doing is concerned. This activity should be of many kinds in the lower classes and later should lead to a basic craft the produce from which should be saleable and the proceeds applied to the upkeep of the school.

(g) Certain elements of cultural subjects which cannot be correlated with the basic craft, must be taught independently.

(h) The training of teachers should be reorganised and their status raised.

(i) No teacher should receive less than Rs. 20 per mensem.

(j) Efforts should be made to recruit more women teachers and to persuade girls of good education to take up teaching.

(k) "Basic" schools should be started only when suitable trained teachers are available.

(l) The curriculum will need revision in the light of experience.

(m) English should not be introduced as an optional subject in "basic" schools.

(n) The State should provide facilities as at present for every community to give religious teaching, when so desired but not at the cost of the State.

(o) No external examinations need be held. At the end of the "basic" school course a leaving certificate based on an internal examination should be given.

(p) Pupils wishing to join other schools at the end of the 5th class (age 11+) should also be granted a leaving certificate.

(q) Promotion from class to class will be determined by the school, though the results of the internal examinations should be subject to the supervisors' inspection.

2. The Board considered these recommendations at its meeting held on the 3rd December 1938. As regards the recommendation that the scheme of "basic" education should first be introduced in rural areas, the question was raised whether it would not be easier to control and watch this experimental scheme in municipalities rather than in the countryside. But as the real basis of the scheme was to attack illiteracy which existed to a much greater extent in rural than in urban areas and as the proposed curriculum was designed mainly for rural schools, the Board endorsed the recommendation of its Sub-Committee.

3. The Board next considered the recommendation that the age range for compulsion should be 6 to 14 years though children could be admitted to the "basic" school at the age of 5. It realised the difficulty of keeping children at school after they became really productive as their retention at school after the age of 11 up to 14 would impose a severe burden on those parents who belonged to the labouring classes and would expect their children to be earning

at that age. It was suggested that in the present circumstances, compulsion should be started with the age limits of 6 to 11 in the first instance, the upper limit to be raised later to 12, 13 or 14. The general feeling however was that, however great the practical difficulties might be, the age range for compulsion from 6 to 14 years as recommended by the Sub-Committee should be regarded as the ultimate objective to be reached by stages.

4. The Board then took up the recommendation of the Sub-Committee that transfer of pupils from the "basic" school to other kinds of school should be allowed after the 5th class or about the age of 11 plus. As it was quite possible that certain children in these "basic" schools might wish to attend a different type of school, for instance a school in which English was taught, the Board felt that this recommendation from the educational point of view was sound.

5. A suggestion was made that the mother tongue of the pupils, i.e., the language which they normally spoke in their homes, should be the medium of instruction. It was felt however that such a course would lead to considerable practical difficulties on account of the presence of several dialects in the same area, and that if the mother tongue were used as the medium of instruction, a large number of text-books in various dialects would be necessary. Again, where one school might give instruction in one dialect and another in the same area in a different dialect, people would not be able to understand each other. The Board did not favour the suggestion of making the various local dialects of the pupils the media of instruction, and recommended that whatever the language used at the medium of instruction, it should be a literary language.

6. The Board then considered the recommendation relating to a common language for India which should be Hindustani. It was pointed out that the introduction of Hindustani as a compulsory subject in the provinces where Hindi and Urdu were generally spoken might be possible but that its introduction in those provinces where it was neither spoken nor understood would be difficult. Another difficulty, which was urged, was that several provinces had already a number of different languages spoken within their jurisdiction, and the introduction of an alien language (Hindustani) as a compulsory subject in those provinces would further add to their language difficulties. It was also stated that it would be difficult to obtain a sufficient number of teachers who could teach effectively in a language which was foreign to them. On the other hand, it was argued that if there were no common language like Hindustani, intercourse between the provinces would not be possible. Another suggestion was that there should be not only a common language for the whole of India but a common script also, *viz.*, Roman. The Board recognised the advantage of having a common language for the whole of India and the general feeling was that Hindustani should be this common language, and that in the provinces where it was not spoken, it should be introduced in schools as a second language. After a general discussion, the Board decided that when forwarding copies of the report of its Sub-Committee to the provincial Governments, these difficulties should be brought to their notice.

7. The Board observed that primary teachers were at present receiving very low pay in various provinces. It felt that a pay of less than Rs. 20 per mensem was likely to affect the success of the Wardha Scheme and wished to emphasise that no trained teacher should receive less than Rs. 20 a month as recommended by its Sub-Committee. In order to induce more women to take up teaching, it was suggested that higher salaries should be offered to women than to men. The Board, however, felt that the recommendation of the Sub-Committee as it stood was sufficient.

8. With regard to the recommendation of the Sub-Committee that English should not be introduced even as an optional subject in the "basic" schools, a fear was expressed that if English were not taught in these "basic" schools, other schools might follow suit so that a child who wished to learn English would not be able to do so. The Board, however, considered that the demand for English would be met by the possibility of transfer after the 5th class or about the age of 11 plus to schools where English was taught as recommended by the Sub-Committee.

9. In the course of discussion on the recommendation of the Sub-Committee that no external examination need be held but that at the end of the "basic" school course a leaving certificate based on an internal examination should be given, it was pointed out that no system of internal examination would ever be satisfactory for the purpose of admission to other schools. But as it was open to the authorities of other schools, to which the pupils of the "basic" schools might seek admission, to prescribe any form of test they considered suitable, the Board approved the recommendation of the Sub-Committee.

10. The Board thus generally approved all the recommendations made in the Report of its Sub-Committee, and resolved that a copy of the Report, together with a summary of the discussion, should be forwarded to the provincial Governments for consideration and such action as they might consider necessary.

11. The Sub-Committee did not consider the question of financing the Wardha Scheme as this was outside its terms of reference, nor did it make any recommendation as regards the co-ordination of this scheme with higher education. To examine these questions of finance and co-ordination and certain other matters arising out of the Wardha Scheme, the Board appointed another Sub-Committee consisting of the following members, with powers to co-opt:—

1. The Hon'ble Mr. B. G. Kher, Premier and Education Minister, Government of Bombay, *Chairman*.
2. The Hon'ble Qazi Ataullah Khan, Minister of Education, Government of the North-West Frontier Province.
3. Rajkumari Amrit Kaur.
4. Mrs. Hansa Mehta, Parliamentary Secretary for Education to the Hon'ble the Prime Minister, Bombay.
5. Dr. Zakir Husain, Principal, Jamia Millia Islamia, Delhi.
6. Pandit Amaranatha Jha, M.A., Vice-Chancellor, Allahabad University.
7. Report of the Syllabus Committee, Central Provinces.
8. Mr. W. H. F. Armstrong, I.E.S., Director of Punjab Instruction, Punjab.
9. The Educational Commissioner with the Government of India.

It was agreed that the Committee should, if possible, visit places where the Wardha Scheme is in operation.

(4) "Basic National Education" containing the Report of the Zakir Husain Committee and the detailed syllabus.

(5) Report of the Committee of the Central Advisory Board of Education appointed to consider the Wardha Education Scheme.

(6) Report of the Primary and Secondary Education Reorganisation Committee, United Provinces.

7. Dr. W. A. Jenkins, I.E.S., Director of Public Instruction, Bengal.

APPENDIX II.

Resolutions of the All-India Muslim Educational Conference regarding Wardha Scheme

Part I.—(*General*)

(1) This conference is of opinion that Government should provide compulsory and free basic education throughout the country. This basic education should cover in the case of boys a minimum period of 8 years, *i.e.*, from the age of 6 to 14 and in the case of girls a minimum period of 6 years, *i.e.*, from the age of 6 to 12.

(2) The Conference is of opinion that the provision of educational facilities for the boys and girls should be separate but if for financial and administrative difficulties it is difficult to make provision for separate education, girls below nine may be educated in mixed schools but there should be separate schools for girls above nine years of age.

(3) The entire basic education should be imparted through the medium of the mother-tongue of students, namely, the medium of instruction for the Muslims of Northern India should be Urdu. In the Provinces where Hindustani language is not spoken, the Provincial language should be the medium of instruction; but every student may be taught Hindustani as Secondary Language. As regards the script, adequate arrangements should be made so that Muslims may learn this language in Urdu script. What is meant by 'Hindustani' language is the language generally spoken and understood by an average educated Muslim and Hindu of Northern India and Deccan.

(4) (a) In this scheme of basic education some suitable vocation or handicraft should be given central importance and the rest of the education should aim at the maximum possible adjustment of the economic and physical environment and the vocation of the child.

(b) In the matter of selection of a vocation this Conference is of opinion that the factors of educational possibilities and environment should be given careful consideration.

(c) In the selection of a basic vocation for girls, special consideration should be given to the fact that their needs and inclinations are different from the boys.

(5) In the Provinces the special educational facilities existing for the Muslims should continue and the foregoing principles of the new basic education should be introduced in the present schools where children of this age are educated but their religious and cultural characteristics should be maintained intact.

(6) Provision should be made for training a sufficient number of Muslim teachers for such schools as mentioned in the resolution No. 5. In this connection the Conference is of opinion that Government should establish a training class under the supervision of the Muslim University Training College which might train teachers for the new scheme.

(7) This conference is of opinion that it is necessary for the general educational machinery that Government should encourage private efforts in connection with the basic education.

(8) While legislating for the compulsory education, consideration should be given to the fact that if the parents can make any other satisfactory arrangements for the education of their girls, such girls may be exempted from attending Government basic schools.

(9) As regards the Advisory Committees or Boards which will be set up in connection with the introduction of basic education, it should be given consideration that the representation of Muslims on the Provincial Committees should be at least that much which they enjoy in the Legislative body of the province; and in the districts that proportionate representation which is fixed for them in the Municipal and District Boards.

(10) Since the introduction of universal compulsory education, the present non-Government institutions which are catering for religious instruction will not be able to discharge their functions effectively; and because without religious instruction, the entire education, according to the Muslims, would be defective and incomplete, in the opinon of this conference it is very essential that arrangements should be made for the compulsory religious education during the school hours for the Muslim students in all the basic schools.

(11) In this connection this committee feels duty-bound to state that the attempts in public schools to create precedents like "Bande-Matram", etc., have caused great anxiety to the Muslim Public as these things wound their religious feelings.

PART II.—(*Secondary Education*).

1. This Conference is of opinion that it is very essential to have proper co-ordination between basic and higher education so that students if they like may continue their studies after the basic education.

2. This Conference is of opinion that in the establishment of school for secondary education due concession should be made for the differing aptitude of the boys, which manifests itself generally at the age of twelve. Therefore those students who are anxious to have secondary education should be given the opportunities to join, after having received basic education for five years, the secondary schools which may be in accordance with their special aptitude.

3. If such secondary schools are to be started by private or educational bodies, such efforts should be encouraged, and the Government should give financial aid.

APPENDIX III.

Note by the Hon'ble Pir Illahi Baksh Nawaz Ali, Minister of Education Government of Sind

Agenda

I. *To consider whether compulsion should be introduced from the age of 6 to 11 years in the first stage or from the age of 7 to 14 without any preliminary stage.*—(a) I would favour an earlier lower age-limit for compulsion for this reason that parents in the rural areas, with which any system of mass education in India will mainly be concerned, would be willing to let their children go to schools while they are still too young to be useful to them in their wage-earning occupations. Earlier the starting age of compulsion, the more willing will this vast mass of parents be to send children to schools and greater therefore will be the success of introduction of compulsion. And once the little children are "captured" with the willing consent of their parents, the new schools if they are everyday a demonstration of their utility, will induce the parents to let their children continue in these schools even after the children are old enough to help the parents in their occupations at home and in the farms. An earlier starting age-limit for compulsion is desirable also on another ground. We take the children at a stage when they are more plastic in body and mind than they would be at a later stage. I would prefer therefore starting age-limit of 6 and not 7 for compulsion, and the age-range of 6 to 11 as the first step towards a more extensive plan of compulsion where provincial finances permit it.

(b) Even with an earlier starting age-limit for compulsion, say 6 years, a preliminary stage of education for children between 3 to 5 years is necessary in any soundly concerned educational psychology as the most formative years in the earlier life of man, and these we cannot neglect. We cannot concentrate on the superstructure and leave the foundation to be laid indifferently. But this problem of "pre-basic" education, whether it should be compulsory, what its objective and methods should be, what provision should be made for the training and supply of teachers for this stage of education, the financing of it, its correlation with basic education, all these are matters which form a big problem by themselves, and ought to be considered carefully as separate items in the agenda of a future meeting of this committee.

(c) Where compulsion for the age-range of 7—14 is introduced, I think it is only natural that it should apply also to those who leave the basic schools at the age of 11, and join anglo-vernacular schools. It should apply to such cases till they attain the age of 14.

II. *To consider what should be the general aim of the entire educational system in a province, and what should be the aims (not inconsistent with the above general aim) for complete basic education for children aged 7 to 14 years, or separately for the two stages of basic education 6 to 11 and 12 to 14, and how far these stages should be complete in themselves and how far a step towards the higher range in the educational ladder.*—This issue was framed by the Sind Government because of the chaotic state of educational planning in the country. While in every aspect of national life, we take care to consider the objective in any campaign, in education we are apt to frame schemes without considering or clearly formulating our aims, and without a clearly visualized goal for our educational programmes, we are apt to land ourselves in an endless morass of complications which will necessitate a fresh overhauling of our educational system. This will only mean a tremendous waste of national energy, enthusiasm and funds in the meanwhile. What kind of individual or citizen do we want our educational system to produce, what kind of

social and political order do we want these products of our educational system to sustain, invigorate and keep alive. Should our educational system emphasize the "bread and butter" objective or should it consider also the claims of culture? Do we want our children to be trained in water-tight communal compartment and perpetuate the old animosities, or shall we broad-base our new system on a catholic conception without endangering the culture and heritage of the different communities? There is a wide conflict of conceptions about educational objectives, and it will be a pity if, at the very threshold of a new era in education, the country should have no clearly visualized goal and go on passing syllabuses and building up new organizations, without a clearly formulated objective. I feel that not only this committee but also the Central Advisory Board should address itself to this primary task before it spends its time and energy on any other problem. Let the entire country be given a right lead in this first essential factor of the Indian educational problem, and then we shall find that we shall emerge out of the chaos into which educational thought in the country has fallen, and every province will be able to evolve sound schemes of education for itself. On this subject also I would suggest a special meeting of the committee, or of the Central Advisory Board. Our entire educational organisation, the various stages of it and the nature of each, the finance, the syllabuses, all will depend on the aim we have in view, and the effectiveness of any system is largely due to a clearly formulated aim. Without such an aim, we would be like a pilgrim who just steps on to the highroad without the slightest idea about where he intends going with the result that, instead of finding his journey smooth and straight, he is subjected to vexations and inconveniences and has often to retrace his footsteps. It may possibly happen that such a pilgrim, because he has foolishly started on a journey without considering his goal, may after many years of travel and trouble, find himself again no further from the starting point, and start his pilgrimage afresh. I feel the best brains in our educational service and outside must be requisitioned to solve this first essential of our educational problems which cannot be solved in a few minutes as one item among 18 in the agenda for this meeting.

III. *To consider the question of co-ordination of the Wardha Scheme with higher education.*—The question of the co-ordination of the Wardha Scheme with higher education is bound up with the problem of our aim in education. If we have any clear aim about the Wardha Scheme, naturally that aim will guide us in framing our higher stages in education without endangering the principle of co-ordination. But have we really a clearly formulated aim in the Wardha Scheme, or is it simply the product of some good impulses or theories which have not yet been brought into vital relationship with each other from the standpoint of some central aim? This question of co-ordination will naturally resolve itself into the following factors, each of which must be given close thought:—

(a) What types of secondary schools, lower or higher, should be set up to serve the needs of those pupils who may join them after completing 8-year or 7-year basic education.

(b) What types of secondary schools should be set up to serve the needs of those pupils who leave the basic schools at the end of 5 years.

(c) Should these two classes of secondary schools have a rich variety of educational content and objectives (either as self contained units or as preparatory stages for University courses or specialised branches of learning or skills), or should they be cast into one mould in the entire province.

(d) Should these post-basic institutions be merely some kind of a continuation of the basic education in aim and method, or should they be actuated by new aims.

(e) What should be the relation of these post-basic secondary schools with the final stages in our educational ladder (the University courses, etc.).

(f) The duration and educational content of each of these stages in education, after the basic education.

(g) Administrative co-ordination of the basic and post-basic education —whether one single education board in administrative charge of all the stages is more likely to secure a unified administrative and educational policy for the educational system in a province, or is it not more convenient and sound to have separate boards for basic, post-basic secondary and University stages.

All these are the several factors that make up the problem of co-ordination, and I have only stated them. A careful consideration of each factor in the problem may be undertaken or not at this meeting as the answers of opinion among the members of the committee may decide.

IV. *To consider the desirability of the division of the basic schools into primary and upper primary schools or stages and the examination of the curriculum in the light of this possible division.*—I personally feel that a bifurcation at the age of 11 plus is desirable and this point of time in the life of a pupil in a basic school and in the duration of basic education should be the point for division of schools in primary and upper primary. Considerations of adolescence, consideration of sex-developments at this stage, consideration of the need of some classes of students to desist to special types of secondary schools at an earlier stage, all these point to the desirability of a division of basic schools into primary and upper primary.

The curriculum of each of the two divisions, while guided by one central aim, should be so fixed as to recognise the general educative process that is sufficient before adolescence and the special educative process that is essential from the onset of adolescence. Perhaps in the primary stage, the subject of importance should be practical civics, organized games and special crafts, while in the primary stage the subjects and activities should be of a more general and spontaneous nature not calling for narrow specialization or definitely productive activity.

V. *To consider the question of the transfer of children from "basic" schools at the age of* 11 *plus to other schools.*—If we agree to divide the basic schools into primary and upper primary stages, one of the reasons is that some students would desire transfer to other types of schools before they complete the entire period of 7 or 8 years in a basic school. But, as such transfers, if indiscriminately made, may defeat the purpose of compulsion, clear rules must be framed to regulate such transfers. In the first place, a pupil or his parent seeking to leave a basic school at the age of 11 plus must show that he wishes to leave it definitely for joining another type of school. He must indicate the school he wishes to join and obtain a note from that school to the effect that he is going to be admitted to that school. Moreover, the pupil desiring this kind of transfer must be certified to have completed the five years in the basic school satisfactorily, and should be required compulsorily to complete two or three years more at his new school.

VI, VII, VIII and IX. These items in the agenda are partially answered in my remarks on item No. V and item No. III. It is a question of "post-basic" schools, and the factors of this problem I have stated in my remarks on item No. III.

X. *To consider the desirability of providing for parallel courses of instruction for girls in the upper classes of "basic" schools.*—If at the age of 11 plus, co-education must cease, I think it would be advisable to have a differentiation of courses for the two sexes in the upper primary stage of the basic schools. In schools where co-education continues right up to the end of the 14th year the purpose of "parallel courses" would be adequately served by allowing certain options specially suited to the aptitude and requirements of girls, *e.g.*, cooking (pastry-making, manufacture of chutneys, marmalades, etc., sewing, embroidery, child-psychology, care of the infants) which, however, would be open for boys also to take up if they so choose. This is already dealt with partially in my remarks on items Nos. II, III and V. This also is a problem of co-ordination, the factors of which I have indicated.

XII, XIII and XIV. These have been dealt with in the Government of Sind Note which appears in the Central Advisory Board's note on action taken or proposed to be taken by Provincial Governments.

XV. *To consider whether it is desirable or practicable for the state to finance "post-basic" and college education.*—This problem is a matter of financial resources of each province. If the Wardha Scheme with an 8-year compulsion is introduced in a province, it leaves hardly anything to be spent on "post-basic" secondary schools and a college education. In this situation, if the needs of mass education are regarded as of paramount importance, post-basic and college education should be left to private enterprise. The only thing the state should do is to organize these stages of higher institutions on sound educational and administrative principles and to relax such regulations as at present impose unnecessary financial limitations on private agencies (*e.g.*, rules about costly buildings or endowment or reserve funds, etc.). While the state must remove these unnecessary impediments from the path of private enterprise in higher education, it must still regulate the standard of teaching and attainments in these institutions as well as impose safeguards against undesirable multiplicity of such institutions and unhealthy competition among them.

If the Wardha Scheme is not adopted or only a limited form of compulsion is introduced, it is desirable and practicable for the state to aid (not entirely finance) "post-basic" secondary schools and colleges.

XVI. *To consider the desirability of establishing a Board to co-ordinate the work of "basic" education undertaken as an experiment or otherwise in various provinces of the country.*—The idea of a central board for basic education is rather premature. I doubt whether all the provinces have really accepted once for all the principles of the Wardha Scheme, and if a Board is established, it would mean an exclusion of some provinces from its membership, though these provinces may ultimately evolve schemes of education which may be found more suited to the needs of India in general and their own area in particular than the Wardha Scheme. I suggest that the purpose of co-ordination and many other useful purposes would be served if a permanent sub-committee of the Advisory Board is set up to examine and co-ordinate *all new* experiments whether on Wardha lines or otherwise. This committee should have one member who should be frequently sent to different provinces on visits to see the working of new experiments. His reports should be annually or more frequently placed before the "New Education Sub-committee" for co-ordination and discussion, and these reports will secure further co-ordination and provide greater stimulus to the zeal for reform in provincial governments from time to time. This sub-committee should be formed of educational experts, one from each province recommended by the provincial governments.

XVII. *To consider the desirability of starting a central bureau to supply*

uniform literature on the topics included in the curriculum of basic schools.

Excellent idea.—The bureau should also collect any useful information that may be available in any provinces and circulate it to all the provinces. It should also keep a note of all good publications on the topics, and draw the attention of all the provinces to them. If possible, a fortnightly educational bulletin with the above object and for co-ordination of new experiments in education (including the Wardha Scheme) may be published by this bureau.

XVIII. *To consider the question of the disposal of the produce of the children's activities.*—I am afraid, the idea that the Government of a province should purchase these articles and sell them to consumers who are expected to pay more for them than the market rates justify, is fantastic. It will never work. But a collecting agency is necessary and a central agency to distribute and sell these articles. The prices of these articles can only be regulated by the general law of demand and supply, or each school or all the schools of a taluka should give a yearly contract to some dealer for the purchase of their articles on some reasonable terms of profit to the dealer and secure through easy payments to the schools.

A General Note.—From the demi-official letter of the Commissioner, it looks as if the main subject for discussion at the meeting is to discuss our terms of reference generally and decide what particular features of the (Wardha) scheme we wish to study on the spot and where we can best see them. I hope, we will be discussing the terms of reference of the Wardha Education Committee not generally but as contemplated in the agenda placed before us. That I understand, is what is meant by a general discussion of our terms of reference. That general discussion confined to the items in the agenda is, I expect, likely to lead us to a consideration of our programme for visits to Wardha scheme centres. But, though a general discussion of our terms of reference on the basis of the agenda supplied to us is welcome, I doubt whether a visit to any of the Wardha scheme centres at this stage of the experiment will be productive of much enlightenment, except in observing the method of teaching and the spirit of the scheme. Many of our problems, such as the correlation of the Wardha scheme with higher education or even the financing of the scheme, or the question of age-range or bifurcation at some stage and numerous other problems connected with the Wardha scheme will not in any way be solved by a visit to places where the Wardha scheme has just been started. We can either work towards a solution of these problems from now in the faith that the Wardha scheme is bound to produce the result of the experiment (not as contemplated but as actually proved in practice). I am strongly of the opinion that where an entirely new educational experiment is concerned; involving radical departures from the existing system, involving many financial and educational complications, we should not extend the field for experimentation on the mere assumption of its ideological soundness. While experimentation on a reasonable scale is necessary, we should not take it for granted that the experiment is bound to succeed and immediately begin solving all the other correlated problems and doing further stages of education on this assumption. I would suggest that instead of visiting the different centres where the Wardha scheme is being tried and formulating our conclusions so soon, we suggest a limited programme of minimum experimentation to all the provinces, and then an expert should visit the experimental centres in all the centres, and the reports of this expert should be annually considered by the Wardha Committee till such time as we have enough material and evidence at our disposal to formulate a forward educational policy for universal adoption all over India with only such modifications for each province as the local conditions justify.

APPENDIX

REPORT OF THE FIRST COMMITTEE OF THE CENTRAL ADVISORY BOARD OF EDUCATION APPOINTED TO CONSIDER THE WARDHA EDUCATION SCHEME, 1938.

The Central Advisory Board of Education at its meeting held in January 1938 appointed a Committee, with powers to co-opt, to examine the scheme of educational reconstruction incorporated in the Wardha Scheme in the light of the Wood-Abbott Report on General and Vocational Education and other relevant documents, and to make recommendations.

This Committee met in Simla on the 28th, 29th and 30th June 1938 and was attended by the following members—:

1. The Hon'ble Mr. B. G. Kher, Premier and Education Minister, Government of Bombay, *Chairman*.
2. The Hon'ble Dr. Syed Mahmud, Minister for Education, Government of Bihar.
3. The Hon'ble Pandit R. S. Shukla, Minister for Education, Government of the Central Provinces and Berar.
4. Lady Grigg.
5. Rajkumari Amrit Kaur.
6. Dr. Sir Zia-ud-Din Ahmad, C.I.E., Ph.D., D.Sc., M.L.A.
7. Mr. W. H. F. Armstrong, I.E.S., Director of Public Instruction, Punjab.
8. Mr. Syamaprasad Mookerjee, Vice-Chancellor, Calcutta University.
9. Dr. Zakir Husain, Principal, Jamia Millia Islamia, Delhi.
10. Khan Fazl Muhammad Khan, Commissioner and Secretary to His Exalted Highness the Nizam's Government, Department of Technical and Vocational Education.
11. Mr. J. E. Parkinson, C.I.E., Educational Commissioner with the Government of India.

Mr. R. M. Statham, C.I.E., I.E.S., Director of Public Instruction, Madras, was unable to attend the meeting as he was on leave out of India.

Mrs. Hansa Mehta, Parliamentary Secretary for Education to the Hon'ble the Prime Minister, Government of Bombay, was co-opted and attended the meeting.

2. The papers mentioned in appendix I to this Report were circulated to the members of the Committee beforehand.

3. *Genesis of the Wardha Scheme.*—The present educational system of India has of recent years been condemned on the grounds that it has failed to adjust itself to changed conditions and is "uninspired by any lifegiving and creative ideal". In 1937 Gandhiji initiated in the columns of the Harijan a discussion of the Indian educational problem and offered many suggestions the main principles of which were:—

(a) The course of primary education should be extended at least to seven years and should include the general knowledge gained up to the matriculation standard less English, and *plus* a substantial vocation.

(b) For the all-round development of boys and girls all training should so far as possible be given through a profit-yielding vocation.

(c) This primary education, besides training the mind, should equip boys and girls to earn their bread by the State guaranteeing employment in the vocations learnt and by buying from the schools their manufactures at prices fixed by the State.

(d) Such education taken as a whole can and must be self-supporting.

(e) Higher education should be left to private enterprise and the State universities should be purely examining bodies.

4. An All-India National Education Conference, which was convened at Wardha in October 1937 under the presidentship of Gandhiji to consider his proposed scheme of self-supporting education, passed the following resolutions:—

(a) that free and compulsory education be provided for seven years on a nation-wide scale;

(b) that the medium of instruction be the mother-tongue;

(c) that the Conference endorses the proposal made by Gandhiji that the process of education throughout this period should centre round some form of manual and productive work and that all the other abilities to be developed or training to be given should, as far as possible, be integrally related to the central handicraft chosen with due regard to the environment of the child;

(d) that the Conference expects that this system of education will be gradually able to cover the remuneration of the teachers.

The age of entry to school should be 7 years and the standard attained at the end of 7 years schooling should approximate to the Matriculation (less English).

5. The All-India National Education Conference then appointed a Committee under the Chairmanship of Dr. Zakir Husain, Principal of the Jamia Millia Islamia, Delhi, to formulate a scheme of basic education on the lines suggested by its resolutions. This Committee worked out in detail the implication of those resolutions and its report is the authoritative Wardha Scheme of Education.

6. That Report (called for purposes of reference, the Zakir Husain Report) was in the hands of each member of the Central Advisory Board of Education Sub-Committee. Before the discussion either on the principles on which the Wardha scheme is based or on its details, Dr. Zakir Husain, whose presence at the meeting was of the utmost value, pointed out that many of the criticisms to which the Wardha Scheme had been subjected, arose from either a misconception of the fundamental ideas on which the scheme rests or from statements extracted from their context which give a false or distorted impression.

7. Dr. Zakir Husain felt that the discussion would be less discursive if he first pointed out what the Wardha Scheme was not. The removal of misunderstandings and the correction of false impressions would enable the members of the Committee to confine their remarks to the real and not to some hypothetical scheme and so avoid irrelevancy.

8. Dr. Zakir Husain mentioned that criticism was directed mainly against the idea that the scheme was conceived wholly with the set purpose of making education self-supporting by the sale of articles made by the pupils. It appeared to be a scheme of production with conscript child labour. This impression was entirely wrong. The scheme was one of education, not production. The educative value of craft-work and activity was throughout emphasised and the economic question was quite subsidiary. Education in Wardha schools would be carried on through real life situations arising from the physical and social environment of the child and the craft activity. Education through activity is now considered by all teachers as "the most effective approach to the problem of providing an integral all-sided education".

9. The Zakir Husain report defines the aim of the Wardha Scheme not as "the production of craftsmen able to practise some craft mechanically but rather the exploitation for educative purposes of the resources implicit in craft work", and sounds a warning of the obvious danger of stressing the economic aspect to the sacrifice of the cultural and educational objectives. The Wardha scheme rejects any mechanical labour in schools *merely* for production and states as a necessary condition of education that "the craft or productive work chosen should be rich in educative possibilities. It should find natural points of correlation with important human activities and interests". This view is identical with that expressed in paragraphs 10-17 and 24-25 of the Wood-Abbott Report and is in complete accord with modern educational thought. The Wardha Scheme deals only with compulsory primary education and does not imply any stoppage of grants to existing schools or colleges.

10. Hence all criticism, directly or indirectly implying that child labour is to be exploited for economic purposes, so that the schools can be wholly or even partially self-supporting is irrelevant. Critics therefore who believe that the schools will be industrial or vocational in the narrow sense and that the system is intended to force young children into prescribed vocations have not appreciated the real significance of the Wardha Scheme.

11. Dr. Zakir Husain deprecated uninformed criticism of the Scheme as a result of statements made by enthusiastic but misguided protagonists. He denied that the scheme would remove unemployment; indeed the question of unemployment was not even mentioned in his report, though he felt that the pupils of the Wardha schools would be better "employable" material than the pupils of existing schools because the Scheme was designed to produce "workers who will look upon all kinds of useful work as honourable and who will be both able and willing to stand on their own feet". He also denied that the Scheme stated or even implied either that the Government would provide employment at the end of the course or that all existing schools were to be transformed immediately into Wardha schools.

12. Dr. Zakir Husain next answered the criticism which had arisen in one form or other mainly from Muslim sources that the proposed Wardha schools neglected religious education, and were entirely secular in outlook. He admitted that the scheme prescribed no syllabus in religious education as the difficulties were obvious, but one of its foundations was a respect for all religions. The Wardha scheme neither made nor implied any alteration in the present position by which any community at its own expense is permitted to give religious teaching in Government or Local Body schools to the pupils of that community out of school hours. Dr. Zakir Husain stated that no community need have the least apprehension that the Wardha Scheme was intended to discourage any form of religion or religious observance.

13. Misunderstanding also existed in regard to co education. The Wardha Scheme does not make co-education compulsory to any age, and can be adopted in either boys or girls or co-educational schools. Indeed it expresses no opinion whatever whether or not co-education is desirable. The option given to parents in the Wardha scheme to withdraw their girls from school after the completion of the twelfth year does not imply that boys and girls should receive co-education up to that age.

14. After illuminating the educational and sociological bases on which the Wardha Scheme rests, Dr. Zakir Husain referred to the charge that under the Wardha scheme universities were to be merely examining bodies and as such would receive no financial aid from Government. Such a charge needs no refutation. His Report expressly excludes any discussion on secondary education for pupils above the age of 14. If the Wardha Scheme is adopted, a system of higher education co-ordinated with the Wardha organisation will have to be worked out.

15. To summarize, the Wardha Scheme—

(a) emphasises education through activity and is not primarily concerned with the production of saleable material;

(b) does not make spinning and weaving the only basic craft, but admits of the inclusion of any craft of equal or higher educative possibilities;

(c) does not imply the ruling out of facilities for religious (denominational) education, where any community desires it; and

(d) does not state or imply that the salary of the teachers must be directly met from the sale of material made in the school.

Dr. Zakir Husain's explanation removed from the minds of some members of the Committee the apprehension aroused by the literature which preceded the formulation of the Wardha Scheme and by some of the phraseology of the Wardha Scheme Report itself and so prepared the ground for a discussion of details.

16. The framers of the Wardha scheme deliberately confined their proposals to village education as the bulk of India's population resides in villages. The scheme is therefore primarily for rural areas. The Committee therefore wish to emphasise that it should first be introduced in rural areas and should not be extended to urban areas without necessary modifications though the principle of education through activity is as true for urban as for rural schools.

17. *Age range for "basic" education.*—The Zakir Husain Committee lays down a seven years course of education from the age of 7 to 14. They however, realise that by fixing 7 as the age for the introduction of compulsory education, they have neglected a very important period of the child's life. In view of financial and other considerations, they did not feel justified in including the education of children below the age of 7 as a part of the compulsory scheme, though they hoped that nursery and infant schools would be started and encouraged by the State.

18. The normal age for admission to school in all advanced countries is 5 or 6. Even in India under the existing system of education children are usually admitted to school about the age of 6. This period of a child's life offers such educative possibilities that the majority of members preferred that the age range for compulsory education should be six years to fourteen years, though children of 5 years of age should not be excluded from school. It was agreed that compulsion could not be made effective merely by-passing

an Act making compulsion universal. Such a course would be unwise and impracticable, but the difficulties must be faced and effective compulsion extended as rapidly as possible.

19. In provinces where compulsion is in force the age limits are usually 6 to 11 (Appendix II). The Committee agree that this higher age limit must be increased to 14. Protagonists of the Wardha Scheme prefer that if for compulsory education, any lesser period than seven years has to be taken, the higher age limit of 14 should remain and whatever period is fixed should be reckoned downward from the age of 14 rather than upward from the age of 6. In other words, compulsion from 9 years to 14 years is preferable to compulsion from 6 years to 11 years. They argue that in the present circumstances education in the early years is of little worth, causes wastage and stagnation and is therefore a waste of money and that the years of adolescence offer greater educative possibilities than the age of childhood. By retaining the higher age limit, civic and social responsibilities, permanent literacy and craft skill and interest can be the better developed.

20. The Committee whilst recommending that the age for compulsion should be 6 to 14 were not unaware of the financial and other difficulties, particularly that of the supply of suitable teachers, and feel that the approach to universal compulsory education from 6 to 14 will depend on the financial and other resources of the different provinces. A number of members prefer the compulsory period to begin from the age of 6 and gradually work up to 14.

21. *Stoppages of Education.*—All schools under the Wardha Scheme are basic schools and therefore no difference in nomenclature between "primary" and "secondary" classes or stages is made. Primary and secondary education, however, form two well-defined stages each with its own scope, aims and methods. The clear distinction in aims and methods between these stages must be kept in view. This question is discussed at length in the Hadow Report. The Central Advisory Board of Education at its first meeting held in 1935 recommended a revised schools organisation consisting of a primary stage of four years, a lower secondary stage of four years and a higher secondary stage of three years. The writers of the Wood-Abbott Report "whole-heartedly commend the general layout of this proposed reconstruction". Indeed every province makes the distinction between primary and secondary or middle education though the dividing line is at the end of the fourth class in some provinces and at the end of the fifth in others. The Committee, however, felt that it was unnecessary to make any recommendation in this connection as the question would need consideration at greater length when the co-ordination of the final form of the Wardha Scheme with higher education is taken up. It was agreed unanimously that transfer to Anglo-vernacular and other schools should be permitted after the completion of the fifth class or about the age of 11+.

22. *Medium of Instruction.*—The Wardha Scheme lays down that the medium of instruction shall be the mother-tongue, that is, the vernacular of the pupils. The Wood-Abbott Report makes the same recommendation and few will be found to disagree. The Committee unanimously approve, though they are aware that in certain provinces a difficulty might arise as more than one vernacular may be spoken. In making this recommendation the Committee wish to emphasise that the term "vernacular" connotes the "literary" language and not a dialect.

23. *Hindustani.*—The object of including Hindustani as a compulsory subject in the school curriculum is, according to the Zakir Husain Committee,

to ensure that all the children educated in the "basic" schools may have a reasonable aquaintance with a common "lingua franca". That Committee has accordingly recommended that in Hindustani-speaking areas this language should be the mother-tongue but the students as well as the teachers will be required to learn both the scripts so that they may read books written in Urdu as well as in Hindi, and that in non-Hindustani speaking areas, where the provincial language will be the mother-tongue, the study of Hindustani should be compulsory during the 5th and 6th years of school life but the children will have the choice of learning either one or other script. Thus teachers who have to deal with children of both types must know both the scripts. The Committee recognise the desirability of a common language for India which should be Hindustani with both the Urdu and Hindi scripts, though some members believe that the adoption of one common script, the Roman, would considerably simplify teaching procedure and tend to unity among different communities. There is the danger that undue influence might be brought to force children to read in the script other than that of their choice, especially when the number of such children is small. The Committee desire to emphasise that full option should be given to children to choose the script and that provision should be made for teaching them in that script.

24. *English.*—Discussion on the question whether English should be taught in the "basic" schools revealed considerable difference of opinion. Some members of the Committee feel that English should have no place in these schools which are primarily meant for rural areas. The study of English in such schools is educationally unsound. The time taken in its study is out of all proportion to the advantage gained and tends to prevent the formation of a firm foundation of education.

25. On the other hand, some members of the Committee believe that a good grounding in English is essential for higher studies and so long as English remains the medium of instruction in colleges and retains its importance in all phases of Indian life, the study of English must be started at an age earlier than 14. The Wood-Abbott Report, with its emphasis on teaching through the vernacular, admits that "the study of English, at least as an optional subject, may have to be included in the curriculum of some of the lower secondary schools where there is a public demand for it".

The Committee, however, agree that the demand for English will be met by the possibility of transfer after the 5th class or about the age of 11+ to schools where English is taught and that English should not be included in the curriculum of "basic" Wardha Schools.

2 . *Craft and Manual Activities.*—The fundamental principle of the Wardha Scheme is education through productive craft activity. Perhaps the word "creative" would be preferred to "productive" by educationists as the word "productive" may be and has been read to imply that economic production outweighs educative development. We emphasise that the Wardha Scheme stresses the educative value of craft work. That saleable material will be produced in the higher classes of the basic schools is no objection to the scheme. Indeed unless saleable material is produced the educative possibilities have not been satisfactorily exploited. The income from the sale of such material might well be applied to the upkeep of the school.

27. It is unnecessary to discuss the educative principle of learning by doing. All recent literature emphasises this principle and all schools with any pretence to be up-to-date have adopted it. Indeed the education of children through hand work in its various forms is one of the outstanding features of

modern education. The Committee unanimously agree with the principle of educating children through purposeful creative activities which should gradually develop into productive work.

28. To prescribe one basic craft in the lowest classes of a school when children of the age of about 6 may join is educationally unwise. The activities in these classes arise from the child's interests and desires and should not be forced on him by the adult. Any activity which appeals to a child's interest is suitable so long as it "makes a demand on a boy's skill, judgment, sense of observation and power of calculation and combines all or some of these in a constructive effort to achieve an end which he himself wishes to achieve." As the Wood-Abbott Report says, "it is not so much the thing made or done as the integration required in the making or doing, which is of educational value". Dr. Zakir Husain himself emphasises this point in his appendix to "The Activity School", when he says "It is not the attainment of skill but the process of acquiring it that is educative". As the child becomes older his interests change. Many of them become less transitory and can be satisfied through one basic craft in which the pupils should reach a high degree of skill. Such crafts as agriculture, weaving, woodwork, metal work provide facilities for educational development, appeal to the growing child's sense of making and doing something, increase his self-respect since the product of his labour has a market value and tend to remove the false idea that manual work is objectionable.

The Committee therefore are of opinion that in the lower classes (to the age of about 10 plus) there should be no single basic craft but that the various forms of activity should serve as a preparation for, and develop into, a productive basic craft in the higher classes

29. It naturally follows that in all basic schools, indeed in all primary classes, various kinds of material for handwork must be available. Unless sufficient material is provided, the school cannot be a centre of activity.

30. *The Teacher.*—The most important condition for the success of any educational scheme is the teacher. Revised methods may be proposed, new procedure suggested or a different organisation adopted, yet these will be ineffective and fruitless unless the teachers are able to appreciate and understand the theory leading to the changes and are competent to carry them out so that the desired intention may result. As Dr. Zakir Husain writes in his report, "it is essential that these teachers should have an understanding of the new educational and social ideology inspiring the scheme combined with enthusiasm for working it out".

31. The teacher must therefore be competent to teach to the standard of the Matriculation in the usual school subjects, must be expert in methods of teaching these subjects through craft activities and must be skilled in the processes and technique of certain basic crafts. Without such teachers the Wardha school cannot succeed and teachers of the type required are practically non-existent at present. To attempt to introduce the scheme over any wide area would invite failure.

32. The pace at which the schools can be established will depend almost entirely on the supply of trained teachers competent to implement the scheme. Hence the Committee agree with the recommendation in the Zakir Husain Report that a reasonably large area should be selected for the experiment and an educational survey of that area should be carried out by the Education Department. Immediate steps should then be taken to train the required number of teachers in the existing normal schools which should be reorganised and restaffed to suit the new system of training. In the meantime all normal schools should be so reorganised and schools should be gradually converted to

activity schools as suitable teachers become available. The provision of suitable teachers will be accelerated when pupils having passed through the Wardha schoods seek training as teachers, for such pupils will have absorbed the spirit of the teaching and will be skilled in some basic craft.

33. At present the usual qualification for a teacher in a primary school is a pass in the vernacular middle school examination (held after completing an eight-year course) followed by one or sometimes two years training in a normal school. Many primary teachers do not possess even these qualifications whilst a small percentage have passed the Matriculation. The qualification, however, is for primary school purposes little if any better than the vernacular middle qualification as the gain in English often does not compensate for the loss in other ways. Obviously teachers with these qualifications cannot be expected successfully to teach satisfactorily up to a standard as advanced as their own.

34. The Wardha Scheme rightly emphasises the importance of the teacher and in order to start the scheme proposes a short emergency course of one year for specially selected teachers. The complete training course, however, is to cover a period of three years.

35. (Before admission to the training college the candidate must have passed the Matriculation examination or have had at least two years' experience after passing the Vernacular Final or equivalent examination. The Committee agree that as the success of the scheme mainly depends upon the teachers it is imperative to prepare competent teachers. Some of the members, however, are apprehensive whether sufficient candidates will be forthcoming to undergo a three years training in return for the exiguous salary a primary teacher now receives.

36. Even after three years course of training, these teachers will hardly be competent to carry out satisfactorily the work in the highest classes of the "basic" schools. The Zakir Husain Committee contemplated the necessity of employing in the higher classes teachers with better academic qualifications on a higher pay and with this view, the Committee entirely agrees.

37. The Committee recommend that effort should be made to increase the supply of competent women teachers. Both the Zakir Husain and the Wood-Abbott Reports point out the need of women teachers especially in the lower classes. This point was discussed at some length in the Report on the Curriculum of Girls' Primary Schools (Central Advisory Board of Education, 1937) and the Committee wish to emphasise the conclusions stated therein in regard to the need of women teachers and the spheres of possible recruitment. Several members of the Committe pointed out that the present low salaries in some provinces would not attract a suitable type of recruit and that the teachers' social status in the villages was as a rule low. This was not surprising as his salary is frequently lower than that of a menial servant. The Committee endorse the recommendation of the Zakir Husain Committee that the salary of a trained primary school teacher should be Rs. 25 if possible, but in no case less than Rs. 20 per mensem. Efforts should also be made to raise the status of the teacher by giving him on public, semi-public and other occasions the respect his profession deserves.

38. "*Cultural Subjects*".—The Committee discussed whether or not it was possible to teach through the basic craft all subjects to the standard anticipated. There was general agreement that in the lowest classes education can be satisfactorily carried out through activities. In this connection the work at Moga and other schools was cited. But as the child advances in age and reaches the higher classes opportunities for centring his cultural work and intellectual progress on the basic craft become less frequent. Much of the academic work even in the highest class can be correlated with the basic craft.

but all aspects of the "cultural" subjects cannot so be treated not even by stretching correlation beyond its legitimate limits. Formal instruction will therefore be necessary to teach certain elements of cultural subjects which cannot naturally be co-ordinated with the basic craft. Dr. Zakir Husain agrees that "the school has to provide for the attainment.....of some passive knowledge. I say this lest we forget that.....not all knowledge comes through our own active experience but through the accumulated experience of generations long past" (The Activity School—Ferriere).

39. *Curriculum.*—The subjects forming the curriculum and the syllabuses of individual subjects were seriously criticised from different points of view. Amongst the points discussed were the length of time allotted to the basic craft, the political tone of parts of the syllabus in Social Studies, the omission of algebra and major games, the ambitious nature of some of the subjects of study, the lack of suitable text-books, and other matters of lesser importance.

40. Dr. Zakir Husain pointed out that the proposed syllabuses were merely tentative and their interpretation depended on the teacher and on the provision of suitable text-books. Experience would show what changes were necessary and the syllabuses would be modified accordingly. The syllabuses published with the Wardha Scheme do little more than indicate the nature of the work of the Wardha schools. Necessary details will be incorported after experience. Indeed, the Wardha Scheme advises the appointment in every province of "academic assistants" whose main duty will be to keep the curriculum under constant examination in the light of educational, local and other demands. Details will also be worked out in the normal schools and training colleges whilst the preparation of suitable text-books will be immediately taken in hand.

With this explanation the Committee noted that the curriculum and syllabuses of the Wardha basic schools are not rigid but will be changed as experience necessitates.

41. *Religious Education.*—The absence of all religious teaching from the curriculum was adversely commented on and this question showed fundamental differences of opinion. On the one hand it was contended that if the State makes education compulsory for all, then the State must make provision for religious education. Muslim members pointed out that religious instruction is an essential part of general education and any scheme of compulsory education which excludes religious instruction will be resented by that community.

42. Dr. Zakir Husain had already pointed out that the Wardha Scheme makes provision for the teaching of the principles common to all religions in the hope of developing mutual respect and toleration. In Gandhiji's words:—

> "We have left out the teaching of religions from the Wardha Scheme of education, because we are afraid that religions, as they are taught and practised today, lead to conflict rather than unity. But on the other hand, I hold that the truths that are common to all religions can and should be taught to all children. These truths cannot be taught through words, or through books. The children can learn these truths only through the daily life of the teacher. If the teacher himself lives up to the tenets of truth and justice then alone can the children learn that truth and justice are the basis of all religions".

43. The majority of members felt that religious teaching was best left to the parents or to the communities concerned, but that the State should permit religious instruction to be given in the school building, out of school

hours. After considerable discussion the Committee agreed that the Government should provide facilities for religious teaching, as at present, but was not unanimous whether or not such teaching should be given in or out of school hours. The question of the inclusion of religious instruction in the curriculum is discussed in the Report of the Women's Education Committee of the Central Advisory Board of Education on the curriculum of Girls Primary Schools (1937). The majority of the members are in agreement with the views expressed in para. 11 of that report. Dr. Sir Zia-ud-din Ahmad and Khan Fazl Muhammad Khan, however, desired that religious instruction should be a school subject. The syllabus of studies for Muslim Theology should be prepared by Muslims, taught by Muslims and the State should provide all facilities.

44. *Examinations.*—The Wardha Scheme of education makes no provision for external examinations but emphasises the need of efficient and helpful supervision as contrasted with mere inspection.

45. In regard to examinations the Committee would go even further than the Wardha Scheme anticipates. The Zakir Husain report states that "the purpose of the examination can be served by an administrative check of the work of the schools in a prescribed area, by a sample measurement of the attainment of selected groups of students conducted by the Inspectors of the Education Board". The Committee feels that even this sample measurement is open to objection and might be omitted. The standard of work in the school should be maintained by the inspecting staff and by local exhibitions of work. Promotion from grade to grade should rest entirely with the school on the results of an internal test. The papers and work of the pupils and the results of the test should be reviewed by the inspecting officer at the time of his visit. At the end of the school course the school itself can grant a leaving certificate after a final internal examination stating merely that the pupil has satisfactorily completed the course of the basic school. The certificate may be countersigned by the supervisory or inspecting officer after he has reviewed the pupil's work in the final test if an additional check is considered necessary. For pupils who leave the basic schools for other schools about the age of 11 plus after having completed the first five classes a similar leaving certificate will suffice. Admission to these schools should be controlled by their Headmasters who may prescribe any form of test they consider suitable for their purpose.

46. *Finance.*—The Committee did not consider the question of finance as this was outside their terms of reference. They wish, however, to point out that "activity" schools will cost more to run in the beginning than the present type of school and that the rate at which compulsion proceeds and the age to which it is applied are primarily financial questions, the consideration of which must be left to the Provinces.

47. *Conclusions.*—The following is a summary of the main conclusions reached at the meeting of the Committee:—

(1) The scheme of "basic" education should first be introduced in rural areas.

(2) The age range for compulsion should be 6 to 14 years, but children can be admitted to the "basic" school at the age of 5.

(3) Diversion of students from the "basic" school to other kinds of school should be allowed after the 5th class or about the age of 11 plus.

(4) The medium of instruction should be the vernacualr of the pupils.

(5) A common language for India is desirable. This should be Hindustani with both the Urdu and Hindi scripts. Option should be given to children to choose the script and provision should be made for teaching them in that script. Every teacher should know both scripts, *viz.*, Urdu and Hindi. Some members of the Committee suggest that the adoption of Roman script might prove a solution to the language difficulty and greatly minimise the work of both scholar and teacher.

(6) The Wardha Scheme of basic education is in full agreement with the recommendations made in the Wood-Abbott Report so far as the principle of learning by doing is concerned. This activity should be of many kinds in the lower classes and later should lead to a basic craft the produce from which should be saleable and the proceeds applied to the upkeep of the school.

(7) Certain elements of cultural subjects, which cannot be correlated with the basic craft, must be taught independently.

(8) The training of teachers should be reorganised and their status raised.

(9) No teacher should receive less than Rs. 20 per mensem.

(10) Efforts should be made to recruit more women teachers and to persuade girls of good education to take up teaching.

(11) Basic schools should be started only when suitable trained teachers are available.

(12) The curriculum will need revision in the light of experience.

(13) English should not be introduced as an optional subject in basic schools.

(14) The State should provide facilities as at present for every community to give religious teaching, when so desired but not at the cost of the State.

(15) No external examinations need be held. At the end of the basic school course a leaving certificate based on an internal examination should be given.

(16) Pupils wishing to join other schools at the end of the 5th class (age 11+) should also be granted a leaving certificate.

(17) Promotion from class to class will be determined by the school, though the results of the internal examinations should be subject to the supervisor's inspection.

B. G. KHER (*Chairman*).
SYED MAHMUD.
R. S. SHUKLA.
GERTRUDE C. GRIGG.
AMRIT KAUR.
ZIA-UD-DIN AHMAD.
W. H. F. ARMSTRONG.
S. P. MOOKERJEE.
FAZL MUHAMMAD KHAN.
HANSA MEHTA.
J. E. PARKINSON.

On account of his illness, Dr. Zakir Husain has not been able to sign the Report. He has, however, approved it.

APPENDIX 1

The following is a list of papers, which were circulated to the members of the Committee:—

1. Resolution passed at the third meeting of the Central Advisory Board of Education, held on the 28th January 1938, appointing this Committee.

2. Proceedings of the All-India National Education Conference held at Wardha in October 1937 to consider Gandhiji's scheme of basic education.

3. Report of the Zakir Husain Committee and the proposed syllabus prepared by it.

4. Note by Mr. J. E. Parkinson, C.I.E., Educational Commissioner with the Government of India, on the objections to the Wardha Education Scheme.

5. Note by Khan Fazl Muhammad Khan, Commissioner and Secretary to His Exalted Highness the Nizam's Government, Department of Technical and Vocational Education, on the Wardha Education Scheme with a chart illustrating a possible scheme of re-organisation of education in Indian schools.

6. Note on the action taken, or proposed to be taken, by the Provinces on the Wardha Education Scheme.

7. Resolution passed by the All-India Educational Conference on the Wardha Education Scheme at its thirteenth session held in Calcutta in December 1937.

8. Report of the Madras Teachers' Guild on the Wardha Scheme of Basic Education.

9. Resolution passed by the Indian National Congress at Haripura in February 1938 on national education in India.

10. Resolutions passed at the first meeting of the Central Advisory Board of Education held in December 1935 on educational reconstruction in India.

11. Circular letter to Provincial Governments and Local Administrations. No. F. 1-6 (a)/36-C. A. B., dated the 30th April 1936, on the resolutions of the Central Advisory Board of Education on educational reconstruction.

12. Resolutions passed by the Indian Universities' Conference in 1934 on educational reconstruction.

13. Circular letter to Provincial Governments and Local Administrations No. F. 83-1/34-E., dated the 25th January 1935, on educational reconstruction in India.

14. Circular letter to Provincial Governments No. L.-1834, dated the 20th January 1938, on Government recruitment and unemployment.

15. Report on Vocational Education in India by A. Abbott, C.B.E., formerly His Majesty's Chief Inspector of Technical Schools, Board of Education, England, with a section on General Education and Administration by S. H. Wood, M.C., Director of Intelligence. (Board of Education, England.

16. Views of the Provincial Governments on the recommendations made in the Wood-Abbott Report.

17. Report on Vocational Education in Hyderabad State by A. Abbott, C.B.E., formerly His Majesty's Chief Inspector of Technical Schools, Board of Education, England.

18. Report of the Sub-Committee for the re-organization of education in the Hyderabad State.

19. Vidya Mandir Scheme—A way to the spread of free and compulsory mass education within a fixed period.

20. Vidya Mandir Syllabus and *Ad Interim* Report of the Syllabus Committee, Central Provinces and Berar.

21. Report on Educational Reconstruction and Vocational Training in the Central Provinces and Berar.

22. Report on Vocational Training in Primary and Secondary Schools and consequent reorganization in Bombay.

23. School Education in Bengal—Resolution No. 1037-Edn., dated the 9th March 1937.

24. Report of the Women's Education Committee of the Central Advisory Board of Education on primary education of girls in India, 1936.

25. Report of the Women's Education Committee of the Central Advisory Board of Education to consider the curriculum of Girls' Primary Schools in India, 1937.

APPENDIX II

	Age range of compulsion Year	
Madras	6—11	
Bombay	6—11	
Bengal	6—10	Under the Bengal Primary Education Act 1919.
	6—11	Under the Bengal (Rural) Primary Education Act, 1930.
United Provinces	6—11	
Punjab	6—11	
Bihar and Orissa	6—10	
Central Provinces	7—11	
Assam	6—11	
Delhi	6—11	

LIST OF PUBLICATIONS OF THE BUREAU OF EDUCATION, INDIA

Serial No.	Names of Publications	Year of publication
1	Report on Vocational Education in India (Delhi, the Punjab and the United Provinces) (E. H. L. 34)	1937
*2	Report of the Women's Education Committee on primary education of girls in India 1936	1937
*3	Report of the Women's Education Committee of Central Advisory Board of Education to consider curriculum of Girls' Primary Schools in India	1937
*4	Report of the Vernacular Education Committee of the Central Advisory Board of Education appointed to consider certain questions connected with the administration and control of Primary Education	1937
5	Report of the First Committee of Central Advisory Board of Education appointed to consider the Wardha Education Scheme (E.H.L. 40)	1938
6	Report of the 2nd Wardha Education Committee of the Central Advisory Board of Education (App. IV to 5th meeting proceedings)	1940
7	Report of the Adult Education Committee of the Central Advisory Board of Education, 1939 (E.H.L. 46) (App. III to 5th meeting proceedings)	1940
†8	Report of the Social Service and Public Administration Committee of the Central Advisory Board of Education in India, 1940, together with the decisions of the Board thereon (E.C. 6)	1941
9	Report of the Joint Committee appointed by the Central Advisory Board of Health and Central Advisory Board of Education on the Medical Inspection of School Children	1941
10	Report of the Scientific Terminology Committee of the Central Advisory Board of Education in India, 1940, together with the decisions of the Board thereon (E.C. 5)	1941
11	Proceedings of the 6th Meeting of the Central Advisory Board of Education held at Madras on 11th and 12th January 1941 (E.C. 4 VI)	1941
12	Proceedings of the 7th Meeting of the Central Advisory Board of Education in India held at Hyderabad, Deccan, on 14th and 15th January 1942 (E.C. 4 V II)	1942
13	Report of the School Building Committee (E.C. 8)	1942
14	Report of the Uniform Braille Code Committee (E.C. 7)	1942
15	Report of the Examination Committee, 1942 (E.C. 12)	1942
16	Report of the Expert Committee on a Uniform Braille Code for India with the Braille charts printed in India Alphabets, 1942, as subsequently modified	1942
17	Proceedings of the 8th Meeting of the Central Advisory Board of Education held at Lucknow (E.C. 4 VIII)	1943
18	Report of the Joint Committee of the Central Advisory Board of Education and the Inter-University Board appointed to investigate the question of the relation of the School Leaving Certificate Examination to the Matriculation Examination, 1942 (E.C. 9)	1943
19	Report of the Committee of the Central Advisory Board of Education on the training, recruitment and conditions of service of teachers (E.C. 10)	1943
20	Report of the Committee of the Central Advisory Board of Education appointed to consider the question of the recruitment of the Education Officer, 1942, together with the decisions of the Board thereon (E.C. 11)	1943
21	Report of the Examination Committee	1943
22	Proceedings of the 9th and 10th Meetings of the Central Advisory Board of Education in India held in October 1943 and January 1944 respectively (E.C. 4 IX & X)	1944
23	Report of the Technical Education Committee, 1943 (E.C. 16)	..
24	Report of the Test Book Committee, 1943 (E.C. 15)	1944
25	Report of the Examination Committee (Technique of Examinations), 1943 (E.C. 17)	1944
	Report of the Committee of Central Advisory Board of Education appointed to consider the question of training, recruitment and condition of service in universities, etc. together with the decisions of the Board thereon (E.C. 22)	1945
27	Report of the Central Advisory Board of Education on Post-War Educational Development in India, 1944 (E.C. 13)	1945

* Not published previously, but proposed to be included in future reprints.
† Published by the Central Advisory Board of Health.

Serial No.	Names of Publications	Year of publication
28	Volume containing reports of the Committees of the Central Advisory Board of Education (E.C. 14)	1945
29	Report of the Administration Committee of the Central Advisory Board of Education	1945
30	Proceedings of the 11th Meeting of the Central Advisory Board of Education (E.C. 4 XI)	1945
31	Report of the Agricultural Education Committee of the Central Advisory Board of Education, 1944 (E.C. 20)	1945
32	Proceedings of the 12th Meeting of the Central Advisory Board of Education held at Mysore in January 1946	1946
33	Report of the Religious Education Committee of the Central Advisory Board of Education	1946
34	Development of Higher Technical Institutions in India (Interim Report of Sarkar's Committee)	1946
35	Report of the Committee of the Central Advisory Board of Education on selection of pupils for Higher Education	1946
36	Report of the Committee of the Central Advisory Board of Education on conditions of service of teachers	1946

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BUREAU OF EDUCATION, INDIA

PAMPHLET No. 16.

Report

of the

Expert Committee

of the

Central Advisory Board of Education

on

UNIFORM INDIAN BRAILLE

with

INK-PRINT CHARTS

for

INDIAN ALPHABETS

AMENDED REPRINT:

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FOREWORD

While the Uniform Indian Braille Code, drawn up by the Expert Committee appointed by the Central Advisory Board of Education, in the form in which it was finally approved by the Board, is being published for use by schools for the Blind in India it is fitting that a short history of the efforts made in that direction till it attained this final form be placed on record.

The Braille alphabet was invented by Louis Braille, a blind young man in Paris in the year 1829 and has since then come to be used as the medium for reading and writing for the Blind all over the world. From the time when the first school for the Blind was established in India in the eighties of the last century, each school before it could start had to draw up or adopt a Braille Code for the reading and writing of the language of the area which it served. Thus a number of Braille Codes came into existence in India, principal among which were:

1. The Shirreff Braille, used for Urdu, Hindi and Gurmukhi in Northern India.
2. The Shah Braille used for Bengali and Bihari in Calcutta and Patna.
3. The Oriental Braille of Messrs. Knowles and Garthwaite used by the American Mission School for the Blind, now known as Dadar School for the Blind for Marathi.
4. The Indian Braille of Dr. Nilkanthrai used by the Victoria Memorial School for the Blind in Bombay and the Schools for the Blind in Poona and Mahsana.
5. The Mysore Braille used for Tamil, Telugu and Kanarese in Mysore.
6. The Tamil Braille of Miss Askwith for use in the Schools for the Blind in Palamcottah and Poonamallee.
7. The Sindhi Braille used in the School for the Blind in Karachi.

This created a babel for the Indian Blind in general and against this necessity for a Uniform Braille System for various Indian languages was gress was made with the education of the Blind in this country, the state of affairs, which was bound to create greater difficulties as more pro- necessity for a Uniform Braille System for various Indian languages was thus keenly felt. Sporadic attempts by the educationists in the field and the Government were also made but no uniformity of the objective could be arrived at.

2. The first movement for unification began with the publication by the British and Foreign Bible Society of the excellent scholarly piece of joint work "The Oriental Braille" by Rev. J. Knowles and Mr. L. Garthwaite in 1902 and it was circulated for opinion but ultimately did not bear the desired result.

3. The next effort for producing a Uniform Braille Code for Indian languages was made by Mr. P. M. Advani who attended by invitation the fourth meeting of the Central Advisory Board of Education held in New Delhi on the 5th January, 1922 to advise the Board on the education of the blind, and explained to them his scheme for a Uniform Braille

System for Indian Vernaculars. The Board at this meeting made the following recommendations to the Government of India:

(i) That a Committee should immediately be appointed by the Central Government to go into the subject of the possibility of a Uniform Braille for all Indian or all Indo-Aryan languages and frame such a Uniform system.

(ii) That at least one up-to-date embossing plant should be established somewhere in India to emboss literature for the blind; also a depot and workshop where apparatus for the education of the blind could be produced and made available.

Mr. Advani later read a paper on his Uniform Code at the 2nd Oriental Conference which met in Calcutta and his paper was published in the Calcutta Review of September, 1922.

The Government of India while in full sympathy was unable to accept these recommendations on account of financial stringency prevailing at the time.

4. In January, 1923, on the initiative of the Rev. Canon W. G. Speight, Principal, Palamcottah Schools for the Blind, a Conference of the Workers for the Blind met at Bombay and considered this subject and resolved:

"That this Conference strongly recommends that all the Braille alphabets at present in use in India shall be thoroughly tested in all the Schools for the Blind with a view to obtaining a complete consensus of opinion thereon".

This consensus of opinion was never achieved as the Conference did not meet again, but Mr. H. D. Chhatrapati, Principal of the Victoria Memorial School for the Blind and brother of Dr. Nilkanthrai continued to press for the adoption of the "Indian Braille" used in his School in all the Schools in India and secured the support of the Government of Bombay for the scheme so that the matter came up again when the reconstituted Central Advisory Board of Education met in December, 1935, but was not considered owing to lack of time. At the 1936 and 1938 meetings of the Central Advisory Board of Education, the subject was also raised in varying forms, but on the strength of the general unfavourable attitude of the Provincial Governments to allot funds for purposes other than for the education of normal children the Board decided that no further action could then be taken in the matter.

5. The National Institute for the Blind, London, also raised the question and in 1932 suggested the setting up of a Braille Printing Press in India, and for that purpose referred to the difficulty caused by the variety of Codes in use in the country. They suggested the formation of an Advisory Committee on the lines of Advisory Committee on the Welfare of the Blind in England. As the majority of the Provincial Governments, to whom this subject was referred by the Government of India, was not in favour of the proposal; it was dropped. In 1936, they again raised the question and suggested that if some of the teachers of the principal Schools for the Blind in India could meet and confer, it might be possible to reach some measure of agreement in the matter.

6. Eventually, at its sixth meeting held at Madras on the 11th and 12th January, 1941, the Central Advisory Board of Education felt that the question of adopting a "Uniform Braille Code" in Schools for the Blind was a matter which called for expert advice. It accordingly asked the Educational Commissioner with the Government of India to appoint a small Committee of experts to go into the question and prepare a report for the Board at its next meeting.

The Educational Commissioner got in touch with the Provincial Governments and asked them to nominate Representatives from their Provinces on this Committee and eventually the following personnel for the Committee was selected which met at New Delhi on the 17th and 18th November, 1941 :—

1. John Sargent, Esq., M.A., C.I.E., Educational Commissioner with the Government of India,—Chairman.
2. Col. A. M. Dick, Irwin Hospital, New Delhi.
3. Lt.-Col. E. O'G. Kirwan, C.I.E., I.M.S., Professor of Ophthalmology, Medical College, Calcutta.
4. Mr. S. C. Roy, M.A., B.L., Lecturer, Calcutta University.
5. Mrs. Evelyn Roy, Honorary Recording Secretary, Lighthouse for the Blind, Calcutta.
6. Mr. A. K. Shah, Principal, Calcutta Blind School.
7. Rev. W. G. Speight, Principal and Manager, Schools for the Blind, Palamcottah, South India.
8. Mr. R. M. Halder, M. Ed., Principal, Dadar School for the Blind, Bombay.
9. Mr. H. D. Chhatrapati, B.A., late Principal, Victoria Memorial School for the Blind, Bombay.
10. Miss Georgina Bateman, Superintendent and Chief Teacher, Blind School, S. P. G. Mission, Ranchi, Bihar.
11. Rao Saheb W. N. Wadegaonkar, Superintendent, Blind Boys' Institute, Nagpur.
12. Mr. P. M. Advani, M.A., B.Sc., Principal, School for the Blind, Karachi.
13. Mahamahopadhyaya Pandit Lachhmi Dhar, M.A., M.O.L., Shastri, St. Stephen's College, Delhi.

Dr. D. M. Sen, M.A., Ph.D. (London), Secretary, Central Advisory Board of Education, was Secretary of the Committee.

Together with the agenda of the Meeting, each member of the Uniform Braille Committee was supplied with a copy of the note written by Mr. H. D. Chhatrapati on the excellence of the Nilkanthrai Code and its adaptibility to all Indian languages, a note by Mr. R. M. Halder on the present position with regard to Codes and the tactual psychology of blind students and one by Mr. S. C. Roy suggesting that the Committee should not allow itself to be led by the protagonist of any particular Code, but must plan things purely from the point of view of the good of the blind, to which fraternity he himself belonged.

Mr. P. M. Advani distributed among the members a new edition of his paper on "A Uniform Braille Code" and there was on the table for reference by members a paper on "Hindustani Uniform Braille" by Mr. K. Bhattacharjee, B.A (Gallaudet, U.S.A.), Principal, Lady Noyce School for the Deaf and Dumb, New Delhi.

Three main principles had been followed in drawing up the Codes which existed at the time and the new one recommended by Mr. Bhattacharjee, namely,

(a) Arrangement of the Braille alphabet along the lines of the Standard English Braille and assignation to them, wherever possible, of Indian sounds corresponding to those they represented in English.

(b) Re-arrangement of the seven lines of Braille so as to give them a horizontal symmetry in addition to the vertical symmetry they already possessed and arranging Indian sounds in their phonetic order against this rearranged scheme, so that related phonetic sounds were obtained from the fundamental one by a Uniform Scheme in each case.

(c) Re-arrangement of the Braille signs in pairs on the principle of mirror images and assignation of sounds to them on the phonetic principles of Indian alphabets, so as to achieve the same result as in (*b*).

The protagonists of the three Schemes were represented on the Committee and after a threadbare discussion of all points, arrived at the following main conclusions and recommendations :

I. That in order to promote the development of the education of the blind in a systematic and co-ordinated manner, it is essential to adopt a Uniform Braille Code for Indian languages as a whole, each Braille sign representing as far as possible the same sound in all Indian languages.

II. That the Uniform Code proposed should be based on the following fundamental principles :—

(*i*) As far as practicable the blind should not be segregated from the sighted in the process of their education.

(*ii*) The original arrangement of the Braille signs in seven lines as in the Standard English Braille should be maintained in the Code to be framed for Indian languages.

(*iii*) In the arrangement of alphabets in the Code, the Phonetic order of grouping in the Indian languages should, as far as practicable, be retained.

(*iv*) Phonetic relations between the letters of the alphabets should be represented, as far as possible, within the decision already reached, by some simple relations between the signs assigned to them.

(*v*) Two-cell arrangements should, as far as possible, be avoided and sounds from the different languages, be accommodated by assigning the same signs to different but related sounds.

III. That none of the current Codes can reasonably be accepted as satisfying the needs of a common Code for all languages of India.

IV. That the question of incorporating contractions and abbreviations can only be taken up after the all-India Code has been formulated.

V. That the Central Advisory Board of Education should set up a small expert Committee including linguists, who shall—

(*i*) work out a Uniform Braille Code in accordance with the principles recommended in this report;

(*ii*) serve as a Central Board of Reference to whom any specific issues that may arise during the transitional period may be submitted;

(*iii*) form the members of an Advisory Body to the Central Advisory Board of Education on the Education of the Blind.

VI. That to ensure adequate production of suitable literature for the Blind, a Central Press with an up-to-date embossing plant and a workshop for manufacturing necessary educational apparatus should be established and a Central Library to serve all the institutions in India should also be founded.

VII. That in order to enable the Schools for the Blind to adopt the new Code and replace their existing stock of literature printed on old lines, the Central and the Provincial Governments should provide such financial assistances as the circumstances may demand.

VIII. That for the execution of any planned programme of education in the interest of the Blind, accurate statistics are essential and the enumeration of the Blind population should be taken up by the Government of India as early as possible, and at any rate not later than the next census.

IX. That the Central and Provincial Governments should be urged to promote legislation for the special benefit of blind persons.

X. That the Central Advisory Boards of Education and Health should jointly consider the problem of the prevention of blindness in this country at an early date.

7. The Board in its seventh meeting held in Hyderabad-Deccan, in January, 1942, approved the above recommendations of the Braille Code Committee of 1941 and in pursuance of the recommendation No. V, set up a small committee with Braille experts, who had already done some work in this connection and linguists for the purpose of drawing up the proposed Uniform Braille Code. The personnel of the expert committee thus set up was :—

1. Dr. Sir John Sargent, M.A., C.I.E., Educational Adviser with the Government of India—Chairman.
2. Dr. Abdul Haq, B. Litt., Ph.D. (Oxon), (Formerly Head of the Department of Arabic, Osmania University), Secretary, All India Anjuman-e-Taraqqi-e-Urdu, Delhi—Linguist.
3. Dr. Suniti Kumar Chatterji, M.A., D. Litt. (London), Head of the Department of Comparative Philology, Calcutta University—Linguist.

4. Mr. P. M. Advani, M.A., B.Sc., Principal, School for the Blind, Karachi—Braillist.

5. Mr. Kalidas Bhattacharjee, B.A. (Gallaudet, U.S.A.), Principal, Lady Noyce School for the Deaf and Dumb, New Delhi—Braillist.

8. The Expert Committee met at Delhi from the 18th to the 22nd December 1942. They had before them the principles on which they were to draw up the Code and an excellent chart of Indian Alphabets drawn up by Mr. K. Bhattacharjee for his "Hindustani Uniform Braille" to guide them in their work. They had also before them a mass of criticism and suggestions on the principles on which the Uniform Code was to be based and decided faithfully to carry out the instructions of the Uniform Braille Committee of the previous year and drew up their report together with a draft of the Uniform Braille Code for Indian languages, which was presented to the Central Advisory Board of Education at its 8th meeting at Lucknow in January, 1943.

The Board gave their careful consideration to the Uniform Braille Code and expressed their genuine appreciation of the work done by the Expert Committee. They thought the issue of utmost importance to the country and recommended that the report of the Expert Committee be circulated to the Provincial Governments, Local Administrations and States concerned for their opinion in the first instance. The Board also directed that the draft Code be forwarded to the National Institute for the Blind, London, for their opinion.

9. The Code, after receiving this approval by the Central Advisory Board of Education, was printed for 12 Indian Languages and for Arabic, and was circulated as above. Criticisms and appreciations of the Code were received from Provincial Governments and the National Institute for the Blind, and these were carefully examined by the Expert Committee who incorporated in the Code some of the suggestions made, compatible with the recommendations and principles laid down by the Braille Code Committee of 1941. The Expert Committee further recommended that at present the existing Report on the Uniform Code with the Braille Charts indicating the suggested incorporations be introduced and at a later stage when such time would come after due practical experiments in schools, the Report and the Charts duly modified may be provided.

The Code as thus amended was submitted to the Central Advisory Board of Education together with the criticisms received.

10. The Central Advisory Board of Education, in their eleventh meeting held at Karachi in January, 1945, considered the views of the Provincial Governments, as well as the views furnished by the National Institute for the Blind, on the Report of the Expert Committee on a Uniform Braille Code for India, together with the above recommendations of the Expert Committee, on the suggestions submitted by the various authorities. The Board accepted the recommendations of the Expert Committee and decided that steps should be taken to bring the Uniform Braille Code as finally approved into use in all schools for the Blind in India. The Board, however, have directed that any difficulties experienced in the actual use of the Code should be brought to the notice of the Expert Committee for their further consideration.

11. After the above resolution had been passed by the Central Advisory Board of Education, Lieut.-Colonel Sir Clutha Mackenzie, Officer on Special Duty (Blindness) set up a Committee of eight persons, including himself, and drew up a Uniform Braille Code named "The Standard Indian Braille", basing it on the principle of assigning the same signs to common sounds between English and Indian languages, and, for this purpose, upsetting the 7-line arrangement of the Standard English Braille which the Uniform Braille Committee of 1941 had laid down as the basis for a Uniform Code.

The Expert Braille Committee met on the 1st and 2nd April, 1946, at New Delhi, and, after carefully considering the papers sent to them by Sir Clutha Mackenzie and after listening to all that he and his colleagues had to say on the subject, came to the conclusion that as the scheme proposed by Sir Clutha had been fully discussed in the 1941 Uniform Braille Committee and rejected, and as the members of the Expert Committee were in agreement with the conclusions of the Uniform Braille Committee on this subject, they did not see any reason for changing the Uniform Code they had drawn up.

12. The Central Advisory Board of Education at their 13th meeting at Bombay on the 9th, 10th and 11th January 1947 considered the Report of their Expert Committee on the Uniform Braille Code for India. Mr. Advani, a member of that Committee who was present by special invitation dealt with various questions raised by members. The Board gave careful consideration to the views of those who advocated the adoption of the 'Standard Indian Braille' in place of the Uniform Braille Code, specially designed for use in India, which had been accepted by the Board in 1945. The Board examined in detail the points put forward for and against the two Codes and unanimously reiterated their original recommendation that steps should be taken to bring the Uniform Braille Code into use in all the schools for the Blind in India as early as practicable.

JOHN SARGENT,
Educational Adviser, Government of India.
July 4, 1947

PREFACE

The Central Advisory Board of Education at their eighth meeting held in January, 1943 gave their careful consideration to the Uniform Braille Code for India prepared by the Expert Committee appointed at their previous meeting and expressed their genuine appreciation of the work done by the Committee. They thought the issue of the utmost importance to the country and recommended that the report of the Expert Committee be circulated to the Provincial Governments, Local Administrations and States concerned for their opinion in the first instance. The Board also directed that the draft Code be forwarded to the National Institute for the Blind in Great Britain for their opinion.

2. At their eleventh meeting in January, 1945, the Board considered the views of the Provincial Governments, etc., as well as the views furnished by the National Institute for the Blind, London, on the report, together with the recommendations of Expert Committee, on the suggestions submitted by the various authorities. The Board accepted the recommendations of the Expert Committee and decided that steps should be taken to bring the Uniform Braille Code as finally approved, into use in all the schools for the blind in India. The Board, however, directed that any difficulties experienced in the actual use of the Code should be brought to the notice of the Expert Committee for their further consideration.

3. The Code as finally approved by the Board is appended to this Report.

REPORT OF

THE EXPERT COMMITTEE ON THE UNIFORM BRAILLE CODE, 1943

After our preliminary meeting on the 18th December 1942, we have been able to draw up a chart of Uniform Indian Braille, and herewith submit the same with a few explanatory notes.

2. We have indicated the manner in which the Code is to be used for the alphabets of the three different groups of Indian languages with the help of one alphabet in each group, but we hope that the Central Advisory Board of Education will publish the Code with all Indian alphabets printed, so that the Code will be available for the use of every school in India without any doubt or difficulty. When that stage is arrived, we shall do our best to help in the correct publication of the Code.*

3. We have based our Code on the recommendations of the Uniform Braille Committee, and have sought to carry them out as far as it is possible. We were directed to retain the original seven line arrangement of Braille and in doing that we regret that we have not been able to take advantage of the horizontal symmetry which would have suited Indian languages better. We have, therefore, made only a very limited use of Principle II (iv)* In the case of the Perso-Arabic alphabets where letters having the same sound are given similar front and back signs, so that if a beginner should find it difficult to distinguish the front signs of line 7 he should yet produce the correct sounds.

4. In ordinary writing the short vowel *a* is supposed to be inherent in the consonants of the Indo-Aryan and Dravidian languages when fully written. They will always be fully written in Braille, and we suggest that the short vowel *a* should be written each time it occurs rather than that the sign of *virama* should be written when a consonant is unmoved by a vowel. We have, therefore, provided no sign for *virama* or *jazm.* This arrangement will make the Code more scientific and more uniform. It will also lead to greater accuracy in reading and writing.

5. The Dravidian languages require two extra vowels, the short *e* and *o* which are not used in the Indo-Aryan and the Perso-Arabic alphabets. These have been provided in line 5 and assigned signs similar to those used for the corresponding long vowels. As a teacher in each language will choose the order in which he teaches the alphabet on modern principles of education, the separation of these two vowels from the main scheme will present no difficulty.

6. We recommend that for the Perso-Arabic alphabets the 10 vowels required should have the same signs as are provided for the Indo-Aryan alphabets as has been the practice up to now. This arrangement is necessitated by reasons of uniformity and has besides other advantages as well.

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*In the attached charts the manner in which the Code is to be used for the 13 alphabets of the three different groups of Indian languages has been indicated. An abridged chart with one alphabet for each of the three groups of languages has also been provided similar to the seven line arrangement in the Standard English Braille to note the adaptations in one and the same chart.

If spelt out as the vowels are done for the sighted in these languages, they will require two or even three signs for each vowel, and economy of writing space is a matter of paramount importance in Braille.

We have provided separate signs for all the consonants required by these alphabets in spite of the fact that some of them have the same sounds as others already provided, because these will be useful for the study of Arabic and the reading and writing of the Quran.

7. No separate signs have been provided for *tashdid* and *tanwin*. For the former it is suggested that the consonant concerned should be written twice as in other languages and for the latter the short vowel involved should be written twice as in the case of the sighted.

8. For classical studies in the Perso-Arabic group of languages we suggest that the sign for the long vowel *a* should be used for *alif* and the same written twice for *alifmadd*, using the short vowels *a*, *i* and *u* for *zabar*, *zer* and *pesh* respectively.

9. For purposes of teaching we recommend that the letters of the alphabet be named as they are in the language as taught to the sighted.

10. Indian Uniform Braille shall be written from right to left and read from left to right.

11. We hope this Code will meet the approval of those who have the welfare of the blind at heart, and will solve the problem of the Uniform Code for India.

JOHN SARGENT (*Chairman*).

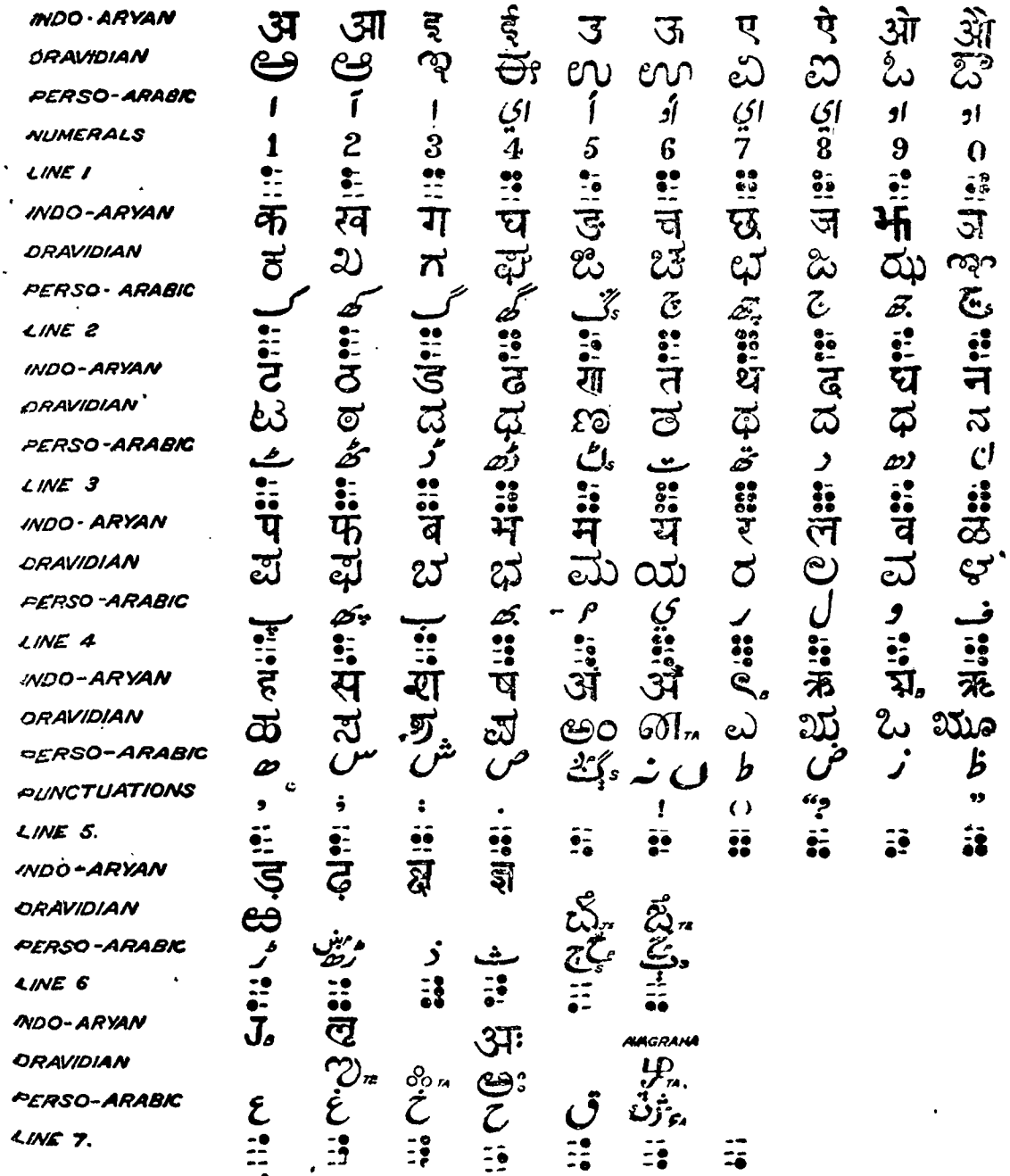
ABDUL HAQ.

P. M. ADVANI.

K. BHATTACHARJEE.

S. K. CHATTERJI.

UNIFORM INDIAN BRAILLE



The Devanagari characters have been used to represent the Indo-Aryan group of language Where additional letters are required they are taken from Bengali and are marked B.

Kanarese letters have been used for Dravidian group of languages. Additional letters have been marked Ta for Tamil and Te for Telugu.

Urdu is used as the base for the Perso-Arabic alphabets. Sindhi, Pushto or Arabic letters are marked S. 'P' and A. respectively.

UNIFORM INDIAN BRAILLE CHART-LINE I.

TRANSLITERATION	a	ā	i	ī	u	ū	e	ai	o	au	1	2	3	4
KANARESE	ಅ	ಆ	ಇ	ಈ	ಉ	ಊ	ಎ	ಐ	ಒ	ಔ	೧	೨	೩	೪
MALAYALAM	അ	ആ	ഇ	ഈ	ഉ	ഊ	എ	ഐ	ഒ	ഔ	൧	൨	൩	൪
TAMIL	அ	ஆ	இ	ஈ	உ	ஊ	எ	ஐ	ஒ	ஔ	௧	௨	௩	௪
TELUGU	అ	ఆ	ఇ	ఈ	ఉ	ఊ	ఎ	ఐ	ఒ	ఔ	౧	౨	౩	౪
BENGALI	অ	আ	ই	ঈ	উ	ঊ	এ	ঐ	ও	ঔ	১	২	৩	৪
DEVANAGARI	अ	आ	इ	ई	उ	ऊ	ए	ऐ	ओ	औ	१	२	३	४
GUJRATI	અ	આ	ઇ	ઈ	ઉ	ઊ	એ	ઐ	ઓ	ઔ	૧	૨	૩	૪
GURMUKHI	ਅ	ਆ	ਇ	ਈ	ਉ	ਊ	ਏ	ਐ	ਓ	ਔ	੧	੨	੩	੪
ORIYA	ଅ	ଆ	ଇ	ଈ	ଉ	ଊ	ଏ	ଐ	ଓ	ଔ	୧	୨	୩	୪
PUSHTO	ا	ا	ا	ا	ا	ا	ا	ا	ا	ا	١	٢	٣	٤
SINDHI	ا	ا	ا	ا	ا	ا	ا	ا	ا	ا	١	٢	٣	٤
URDU	ا	ا	ا	ا	ا	ا	ا	ا	ا	ا	١	٢	٣	٤
ARABIC	ا	ا	ا	ا	ا	ا	ا	ا	ا	ا	١	٢	٣	٤
NUMERALS	1	2	3	4	5	6	7	8	9	0				
BRAILLE	⠁	⠃	⠉	⠙	⠑	⠋	⠛	⠓	⠊	⠚	⠁	⠃	⠉	⠙

TRANSLITERATION	u	ū	e	ai	o	au	5	6	7	8	9	0		
KANARESE	ಉ	ಊ	ಎ	ಐ	ಒ	ಔ	೫	೬	೭	೮	೯	೦		
MALAYALAM	ഉ	ഊ	എ	ഐ	ഒ	ഔ	൫	൬	൭	൮	൯	൦		
TAMIL	உ	ஊ	எ	ஐ	ஒ	ஔ	௫	௬	௭	௮	௯	௦		
TELUGU	ఉ	ఊ	ఎ	ఐ	ఒ	ఔ	౫	౬	౭	౮	౯	౦		
BENGALI	উ	ঊ	এ	ঐ	ও	ঔ	৫	৬	৭	৮	৯	০		
DEVANAGARI	उ	ऊ	ए	ऐ	ओ	औ	५	६	७	८	९	०		
GUJRATI	ઉ	ઊ	એ	ઐ	ઓ	ઔ	૫	૬	૭	૮	૯	૦		
GURMUKHI	ਉ	ਊ	ਏ	ਐ	ਓ	ਔ	੫	੬	੭	੮	੯	੦		
ORIYA	ଉ	ଊ	ଏ	ଐ	ଓ	ଔ	୫	୬	୭	୮	୯	୦		
PUSHTO	ا	ا	ا	ا	ا	ا	٥	٦	٧	٨	٩	٠		
SINDHI	ا	ا	ا	ا	ا	ا	٥	٦	٧	٨	٩	٠		
URDU	ا	ا	ا	ا	ا	ا	٥	٦	٧	٨	٩	٠		
ARABIC	ا	ا	ا	ا	ا	ا	٥	٦	٧	٨	٩	٠		
NUMERALS														
BRAILLE	⠥	⠧	⠭	⠽	⠵	⠳	⠑	⠋	⠛	⠓	⠊	⠚		

UNIFORM INDIAN BRAILLE CHART-LINE II.

TRANSLITERATION	k	kh	g	gh	ṅ	c	ch	j	jh	ñ
KANARESE	ಕ	ಖ	ಗ	ಘ	ಙ	ಚ	ಛ	ಜ	ಝ	ಞ
MALAYALAM	ക	ഖ	ഗ	ഘ	ങ	ച	ഛ	ജ	ഝ	ഞ
TAMIL	க				ங	ச		ஜ		ஞ
TELUGU	క	ఖ	గ	ఘ	ఙ	చ	ఛ	జ	ఝ	ఞ
BENGALI	ক	খ	গ	ঘ	ঙ	চ	ছ	জ	ঝ	ঞ
DEVANAGARI	क	ख	ग	घ	ङ	च	छ	ज	झ	ञ
GUJRATI	ક	ખ	ગ	ઘ	ઙ	ચ	છ	જ	ઝ	ઞ
GURMUKHI	ਕ	ਖ	ਗ	ਘ	ਙ	ਚ	ਛ	ਜ	ਝ	ਞ
ORIYA	କ	ଖ	ଗ	ଘ	ଙ	ଚ	ଛ	ଜ	ଝ	ଞ
PUSHTO	ک		ګ			څ		ځ		
SINDHI	ڪ	ک	گ	گھ	ڱ	ڇ	ڇ	ڄ	ڃ	ڃ
URDU	ک	کھ	گ	گھ		چ	چھ	ج	جھ	
ARABIC	ك				ڭ			ج		
BRAILLE	⠅	⠏	⠛	⠟	⠬	⠉	⠡	⠚	⠴	⠒

UNIFORM INDIAN BRAILLE CHART-LINE III.

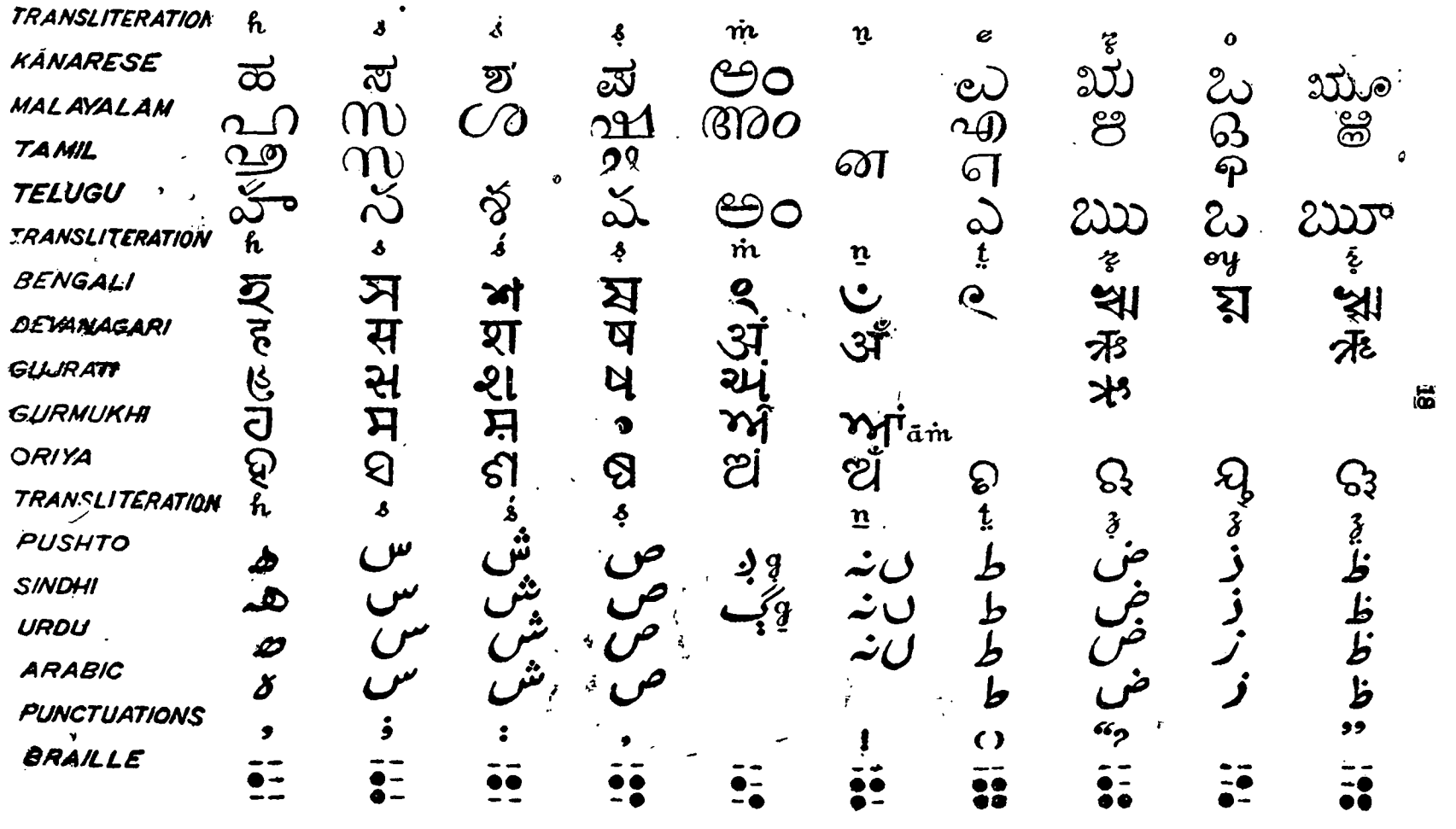
TRANSLITERATION	t	th	d	dh	n
KANARESE	ತ	ಥ	ದ	ಧ	ನ
MALAYALAM	ത	ഥ	ദ	ധ	ന
TAMIL	த				ன
TELUGU	త	థ	ద	ధ	న
BENGALI	ত	থ	দ	ধ	ন
DEVANAGARI	त	थ	द	ध	न
GUJRATI	ત	થ	દ	ધ	ન
GURMUKHI	ਤ	ਥ	ਦ	ਧ	ਨ
ORIYA	ତ	ଥ	ଦ	ଧ	ନ
PUSHTO	ټ	ټ	ډ	ډ	ڼ
SINDHI	ٽ	ٿ	ڈ	ڌ	ڻ
URDU	ٹ	ٹھ	ڈ	ڈھ	ن
ARABIC	ت	ث	د	ذ	ن
BRAILLE	⠞	⠹	⠙	⠮	⠝

UNIFORM INDIAN BRAILLE CHART-LINE IV.

TRANSLITERATION	p	ph	b	bh	m	ṭ	ṭh	ḍ	ḍh	ṇ
KANNARESE	ಪ	ಫ	ಬ	ಭ	ಮ	ಟ	ಠ	ಡ	ಢ	ಣ
MALAYALAM	പ	ഫ	ബ	ഭ	മ	ട	ഠ	ഡ	ഢ	ണ
TAMIL	ப				ம	ட				ண
TELUGU	ప	ఫ	బ	భ	మ	ట	ఠ	డ	ఢ	ణ
BENGALI	প	ফ	ব	ভ	ম	ট	ঠ	ড	ঢ	ণ
DEVANAGARI	प	फ	ब	भ	म	ट	ठ	ड	ढ	ण
GUJRATI	પ	ફ	બ	ભ	મ	ટ	ઠ	ડ	ઢ	ણ
GURMUKHI	ਪ	ਫ	ਬ	ਭ	ਮ	ਟ	ਠ	ਡ	ਢ	ਣ
ORIYA	ପ	ଫ	ବ	ଭ	ମ	ଟ	ଠ	ଡ	ଢ	ଣ
PUSHTO	پ	ف	ب	ب	م	ټ	ټ	ډ	ډ	ڼ
SINDHI	پ	ڦ	ب	ڀ	م	ٽ	ٺ	ڈ	ڍ	ڻ
URDU	پ	ف	ب	بھ	م	ٹ	ٹھ	ڈ	ڈھ	ڻ
ARABIC	ب	ف	ب	ب	م	ط	ط	د	د	ن
BRAILLE	⠏	⠋	⠃	⠓	⠍	⠞	⠹	⠙	⠮	⠝

TRANSLITERATION	t	th	d	dh	n	c	ch	j	jh	ñ
KANNARESE	ತ	ಥ	ದ	ಧ	ನ	ಚ	ಛ	ಜ	ಝ	ಞ
MALAYALAM	ത	ഥ	ദ	ധ	ന	ച	ഛ	ജ	ഝ	ഞ
TAMIL	த				ந	ச				ஞ
TELUGU	త	థ	ద	ధ	న	చ	ఛ	జ	ఝ	ఞ
BENGALI	ত	থ	দ	ধ	ন	চ	ছ	জ	ঝ	ঞ
DEVANAGARI	त	थ	द	ध	न	च	छ	ज	झ	ञ
GUJRATI	ત	થ	દ	ધ	ન	ચ	છ	જ	ઝ	ઞ
GURMUKHI	ਤ	ਥ	ਦ	ਧ	ਨ	ਚ	ਛ	ਜ	ਝ	ਞ
ORIYA	ତ	ଥ	ଦ	ଧ	ନ	ଚ	ଛ	ଜ	ଝ	ଞ
PUSHTO	ت	ټ	ډ	ډ	ن	چ	چ	ج	ج	ڼ
SINDHI	ت	ٿ	ڈ	ڌ	ن	چ	ڇ	ج	ڄ	ڃ
URDU	ت	تھ	ڈ	دھ	ن	چ	چھ	ج	جھ	ڃ
ARABIC	ت	ث	د	د	ن	ج	ج	ج	ج	ن
BRAILLE	⠞	⠹	⠙	⠮	⠝	⠉	⠡	⠚	⠵	⠻

UNIFORM INDIAN BRAILLE CHART-LINE V.



EXPLANATORY NOTE

The history of past attempts for the adoption of a Uniform Braille Code in the schools for the blind in India will be found in the Proceedings of the Sixth Meeting of the Central Advisory Board of Education in India held at Madras on the 11th and 12th January 1941 on pages 54-55—Appendix I (h) read with the Report of the Uniform Braille Code Committee, both of which are published.

2. The report of the Expert Committee appointed to work out a Uniform Braille Code is on page 11 and the decisions of the Board thereon are given in the Preface to this report. The Uniform Indian Braille is on page 13 and the Uniform Code with 12 Indian alphabets and the Arabic alphabet to show how it can be used in schools for the blind all over the country is to be found on pages 14 to 19 of this report. Arabic though not an Indian language is included because it was felt by the Committee that the value of a Uniform Indian Code would be enhanced if the Muslim blind in India could use the Code for writing and reading the Quran. The Code for Arabic may, if so desired, be used in the more orthodox style. For Urdu, the vowels in Line I are written in the form adopted by the Anjuman-e-Taraqqi-e-Urdu and used by the Osmania University of Hyderabad-Deccan. The orthodox form of these vowels is the same as that used for Pushto and Sindhi.

3. The charts published herewith prove conclusively the need there was for a Uniform Indian Braille Code to take the place of the many Codes which exist today because in the case of the first forty signs of the Braille alphabet all Indian languages are almost identical. The common features of the Indian alphabets do not end with the first forty signs but extend further into a considerable portion of the remaining 23 Braille signs. Tamil has a very short alphabet and does not use many of these signs but it fits in with the scheme. Pushto does not use the aspirated consonants but it too fits in admirably. So far almost every school had a Code of its own and in some cases schools teaching the same language used different Codes so that children of one school could not read from the books used in the other or correspond with friends who had been trained in the other school.

4. The charts also justify the decision of the Uniform Braille Committee of 1941, which laid down the fundamental principles on which the Uniform Code was to be based, that the phonetic order of grouping used in the majority of Indian alphabets, should be retained. This phonetic order brings out very clearly the great similarity between the alphabets of the three groups of Indian literary languages. The alphabets classed here as Indo-Aryan cover all the North-Indian languages which belong to the Indic class of the Indo-Germanic family of languages. The Dravidian languages belong to a different family, but their alphabets on account of the large admixture of Aryans with the Dravidians of South India have in course of time come very close together, Tamil alone retaining its short alphabet. The Perso-Arabic alphabets cover four principal languages, Pushto, Urdu, Punjabi and Sindhi. Of these the first belongs to the Iranic class of the Indo-Germanic family of languages while the other three are Indo-Aryan in origin. Their alphabets, therefore, show great similarity

in their phonetic values to the Indo-Aryan languages but owing to the use of a large number of words of Arabic origin in these languages they also require a number of letters from the Arabic alphabet, many of which have changed their phonetic values by such adoption. These alphabets have, therefore, a larger number of letters in them.

The adoption of the original seven line arrangement of Braille has enabled the Committee to retain in the Uniform Code all international items so that the numerals, the punctuations and the language and mathematical signs for the Uniform Indian Braille are the same as for the Standard English Braille.

5. The Code was actually drawn up by the Braillist members of the Committee, under the guidance of their linguist colleagues. They have faithfully carried out the instructions given to them in the fundamental principles laid down by the Uniform Braille Committee, even though it meant a considerable modification of what they considered to be more a scientific scheme for a Uniform Code. An effort has been made to make the Code include all that would be needed in the different languages of India, but it is possible that at this preliminary stage some omissions and discrepancies may have occurred, and if any such are detected and brought to their notice, the Expert Committee would try their best to provide for them.

6. Indian languages have a total of 89 different sounds which have to be represented, and therefore it was necessary to use a number of Braille signs to represent more than one sound each, generally in different groups of languages. The Perso-Arabic Group of languages presented special difficulty in that this group alone had 68 sounds to be represented, but Sindhi and Pushto had each four sounds peculiar to itself and these have been represented by four signs of Braille, two sounds one in Sindhi and one in Pushto to a Braille Sign and by dealing with other peculiarities also in the same way it has been possible to work out Uniform Code with only 62 Braille signs, leaving the last one for future use in making up two-cell signs and contractions.

7. The Uniform Code here presented is the result of the largest possible agreement among those concerned with the education of the blind who formed the Uniform Braille Committee of 1941 and of a considerable amount of labour and thoughtfulness on the part of the Expert Committee, appointed by the Central Advisory Board of Education. It will, I hope, be a great step forward in the education of the blind in India and will bring the establishment of a Braille Press in India into early realization.

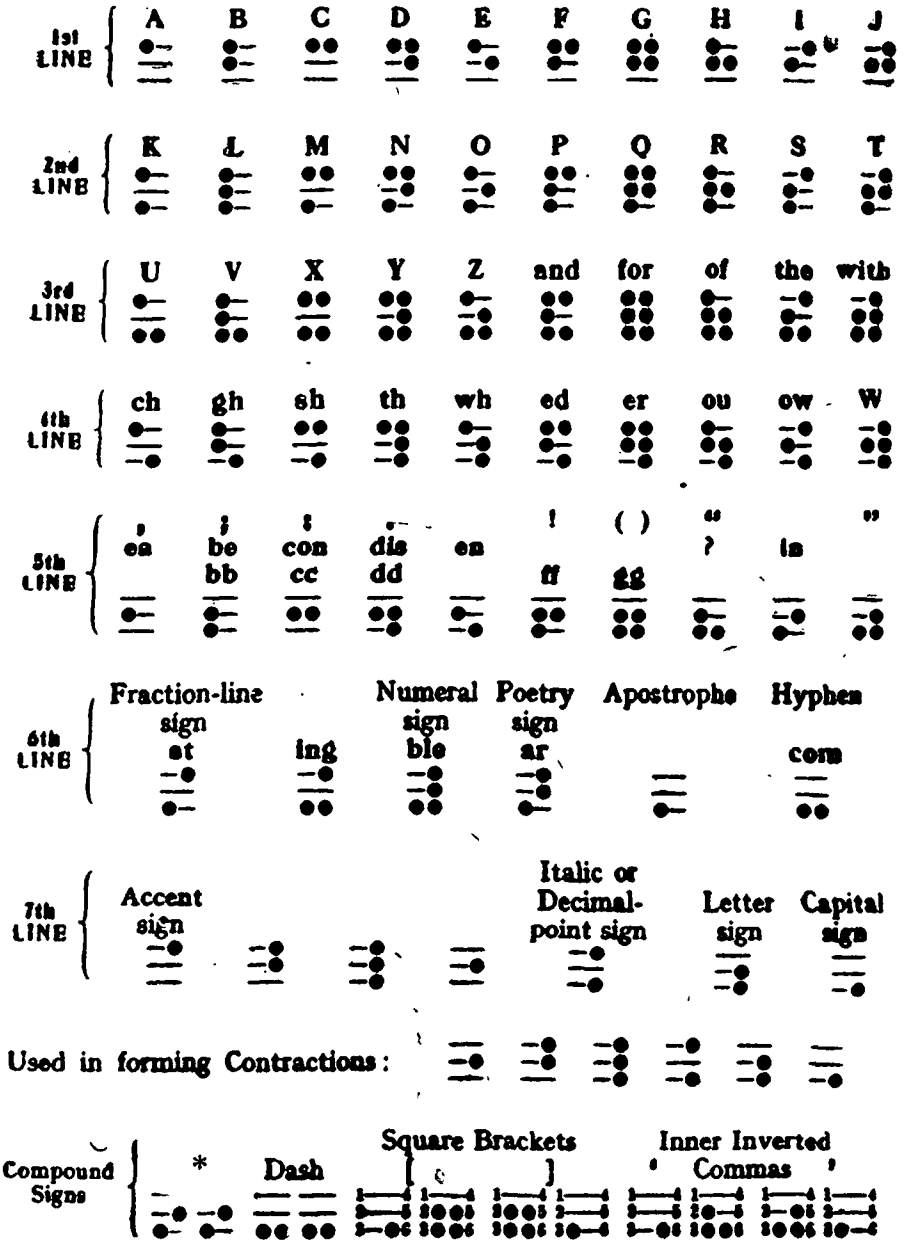
JOHN SARGENT,

Educational Adviser to the Government of India.

GIPD—S1—9 D of E—22-11-47—1,000.

C.X.D.38.

STANDARD ENGLISH BRAILLE



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Notes

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